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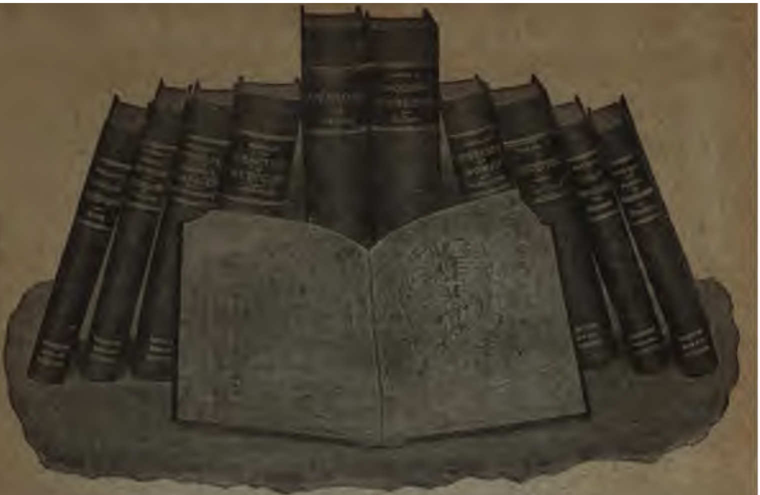

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OF

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Fellow of the College of Physicians of Philadelphia; Honorary Member of the Altoona Academy of Medicine; Associate Member of the Association of Military Surgeons of the United States; Member of the American Medical Association, of the Pennsylvania State Medical Society, of the Philadelphia County Medical Society, of the Pathological Society of Philadelphia; Physician to St. Joseph's Hospital.

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To the Memory of

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DEPRIVED THE MEDICAL PROFESSION OF AN EARNEST

AND TALENTED WORKER,

THIS BOOK IS AFFECTIONATELY INSCRIBED

BY HIS FRIEND,

THE AUTHOR.

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PREFACE TO THE FIFTH EDITION.

In the preparation of this edition it has been the object of the author not only to follow closely the last edition of the U. S. Pharmacopœia, but also to bring the book, as nearly as possible, thoroughly abreast of the times. Much that was obsolete has therefore been omitted, and many new drugs, especially among the groups of antipyretics and hypnotics, have been added, while the older subject-matter has been carefully revised and corrected.

In deference to the criticisms of English and Canadian medical journals, the dosage of each preparation has been expressed in the metrical weights and measures as well as in apothecaries' weight and wine measure. This change has been rendered necessary also by the adoption of the metrical system by the Medical Corps of the United States Army, many of whose officers have in the past used, and I hope in the future will continue to use, this little book for reference.

One word in regard to former criticisms, which on the whole have been most kind and considerate: The author is criticised for his classification of medicines. He thinks, with Lauder Brunton, that the time has come in scientific medicine when an attempt at classification, however imperfect and tentative, should be made, instead of giving up the entire subject as hopeless, and arranging the remedies in alphabetical order; in which case, probably, as in a book before him, remedies as diverse in their effects and uses as *croton oil*, *cubebs*, *cyanide of potassium*, *digitalis*, *elaterium*, and *ergot* would follow each other, to the endless confusion of the student, who knows that the only way he can master a subject thoroughly is by systematizing his knowledge and his method of study, which is hardly possible if he learns in succession, and without any connection with each other, the effects and uses of *oxide of zinc, oxygen, pancreatin, paraldehyd*, and *pareira*, to take a few examples of such classification at haphazard. While admitting that his classification is not free from faults, the author regards it as much preferable to the examples quoted.

By adopting a classification based on a therapeutical rather than a physiological method, the entire book is a therapeutical index; and while the names of diseases do not appear in the table of contents, it is in reality, from its arrangement, an index to the remedies adapted to the treatment of various diseased conditions.

The author acknowledges his indebtedness to numerous standard text-books, as the National Dispensatory; the U. S. Pharmacopœia; Wood's, Hare's, Lauder Brunton's, Foster's, and Wilson's Therapeutics; Maisch's Organic Materia Medica; Bloxam's Chemistry; Blythe on Poisons; as well as various medical annuals, as those of Sajous, Gould, the International Medical Annual; and to writers in the various medical journals, whose papers, though too numerous to mention, form the great bulk of new matter in this edition.

The author takes pleasure in thanking Dr. Henry C. Haden for his valuable work in gathering references and abstracts; and his acknowledgments are also due to Miss Caroline M. Irwin for the exhaustive and thorough index, which he is sure will add much to the value of this edition.

In conclusion, he renews the dedication to the memory of his friend, the late Dr. Theodore Horwitz, and while thanking the profession and critics for their kind reception of former editions, expresses the hope that they will find the present edition equally worthy of their confidence.

HENRY MORRIS.

313 S. 16th St., Philadelphia.

PREFACE.

The object of this little book is, not to replace or attempt to replace with the student the larger text-books on Materia Medica, but simply to give him, in condensed form, the principles of this branch of medicine, without a knowledge of which he can neither pass his final examinations, nor practice his profession intelligently.

The author hopes that, if properly used, this book will be of service to the student and young practitioner, but he is sure, from his experience as a teacher, that neither this nor any other "compend" will suffice to form the groundwork of what is really the study of a lifetime—the Science of Medicine.

In regard to the classification of drugs, he would say that this work was commenced before the excellent arrangement contained in the last edition of Prof. Wood's Therapeutics was published, and not being satisfied with any of the groupings which he had seen, he was induced to adopt a classification based on therapeutic rather than physiological grounds, which, however, he is pleased to think agrees very nearly with that of the latest edition of Wood. In conclusion he must acknowledge his indebtedness not only to the standard text-books, such as the admirable works of Wood, Bartholow, Ringer, Lauder Brunton and many others, but also to many writers in the medical journals, both of this and other countries, to whom want of space has prevented him from giving due credit in the appropriate place. He must also acknowledge the kindness of his friend, Dr. Henry D. Moore, to whom he is indebted for the preparation of the index.

Believing that the critic is the best friend of the medical author, he will thankfully receive any criticisms or hints from either public or private sources.

HENRY MORRIS.

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TABLE OF CONTENTS.

PAGES

DEFINITIONS.—(Materia Medica, Pharmacy, Pharmacology, Therapeutics, Remedies, Pharmacopœia, Dispensatory, Official preparations), ... 17-23

WEIGHTS AND MEASURES.—(Troy or Apothecaries' weights, Wine or Apothecaries' measure, Metrical or decimal system of weights, Tables showing the value of Apothecaries' weights in the metrical system, Table showing the value of Apothecaries' measure in the metrical system, Approximate measures), ... 23-26

PRESCRIPTION WRITING.—(Purposes for which medicines are combined, Precautions to be observed in prescription writing, Component parts of a prescription, Method of writing a prescription, Calculation of dose, General rules for dosage), . . . 26-30

INFLUENCES THAT MODIFY EFFECTS OF MEDICINES.—(Age, Sex, Idiosyncrasy, Constitution, Habitual use, Condition of digestive and absorbent systems, Diseases, Mode of administration), ... 30-32

ADMINISTRATION OF MEDICINES.—(Enepidermic, Epidermic, Endermic, and Hypodermic methods, By the mucous membranes, By intravenous injection), ... 32

CLASSIFICATION OF MEDICINES, ... 33, 34

GROUP I.—SYSTEMIC MEDICINES, ... 35-244

CLASS I.—MEDICINES ACTING ON THE BODY AT LARGE, BY THEIR INFLUENCE ON DIGESTION, NUTRITION (tissue waste and repair), AND CALORIFICATION, . . 35-90

ORDER 1.—*Digestants*—(Pepsin, Ingluvin, Pancreatin, Papain), ... 35-37

ORDER 2.—*Tonics*—(Quassia, Gentian, Calumba, Chirata, Serpentaria, Eucalyptus, Prunus Virginiana, Anthemis,

PAGES

Matricaria, Eupatorium, Cascarilla, Absinthium, Cinchona and its alkaloids, Hydrastis, Preparations of Iron and of Manganese, Phosphorus, Mineral acids, Lactic acid), . . . 37–59

ORDER 3.—*Alteratives*—(Preparations of Mercury and of Gold, Iodine, the Iodides, Arsenical preparations, Cod-liver oil, the Phosphates and Hypophosphites, Calcium chloride, Ammonium chloride, Colchicum, Sarsaparilla, Guaiac, Mezereum, Menispermum, Calendula, Sassafras, Stillingia, Dulcamara, Lappa), ... 59–77

ORDER 4. *Antipyretics*—(Antipyrine, Acetanilid, Phenacetin, Phenocoll, Quinine, Salicin, the Salicylates, Salol, Salophen, Guaiacol, Resorcin, Hydroquinone, Pyrocatechin, Chinoline, Thalline, Kairine), ... 77–90

CLASS II. MEDICINES ACTING ON THE BODY, BY THEIR EFFECTS ON THE VARIOUS ORGANS, ... 90–202

(*a*) ON THE NERVOUS SYSTEM, ... 90-146

ORDER 1. *Hypnotics*—(Opium and its alkaloids, Chloral, Chloralamide, Chloralose, the Bromides, Hyoscine, Sulphonal, Trional, Tetronal, Paraldehyd, Urethan, Cannabis Indica, Humulus, Lactucarium), ... 90–107

ORDER 2. *Mydriatic Anodynes*—(Belladonna, Stramonium, Hyoscyamus, Duboisia, Coca, and their alkaloids, Antipyrine), ... 107–116

ORDER 3.—*Anæsthetics*—(Ether, Chloroform, Nitrous oxide, Methylene bichloride, Ethyl bromide, Bromoform). *Local Anæsthetics*—(Cold, Rhigolene, Ether, Ethyl chloride, Cocaine, Eucaine, Menthol, Guaiacol, Tincture of aconite), ... 116–126

ORDER 4.—*Antispasmodics*—(Musk, Valerian, the Valerianates, Asafetida, Camphor, Monobromated camphor, Ethereal oil, Hoffmann's anodyne, Cypripedium, Scutellaria), . 126–130

ORDER 5.—*Excito-motors*—(Nux vomica and its alkaloids, Rhus toxicodendron, Picrotoxin), ... 130–134

ORDER 6.—*Depresso-motors*—(Physostigma, Chloral, the Bromides, the Nitrites, Gelsemium, Prussic acid, the Cyanides, Oil of Bitter Almond, Lobelia, Conium, Woorara, Tobacco), ... 134–146

PAGES

(*b*) ON THE ORGANS OF CIRCULATION, ... 146–169

ORDER 1.—*Stimulants*—(Alcohol, Ether, Ammonium, Amyl nitrate, Nitroglycerin, Atropine, Digitalis, Caffeine, Adonidine, Strophanthus, Sparteine, Strychnine, Cimicifuga, Convallaria), ... 146–159

ORDER 2.—*Sedatives*—(Antimonial preparations, Aconite and its alkaloids, Veratrum Viride, Veratrine, Gelsemium, Pulsatilla, Arnica, the Vegetable acids), ... 159–169

(*c*) ON THE SEXUAL ORGANS, ... 169–177

ORDER 1.—*Aphrodisiacs*—(The Tonics generally, especially Phosphorus, Zinc phosphide, and Iron. The Phosphates and Hypophosphites, Gold, Arsenic, Cod liver oil, Opium, Alcohol, Cannabis Indica, Musk, Camphor, Nux vómica, Stimulants, Hamamelis, Ergot, Cantharides, Myrrh), ... 169

ORDER 2. — *Anaphrodisiacs* — (Nauseants, Purgatives, Opium (full doses), the Bromides, Monobromated camphor, Iodine and the Iodides, Potassium nitrate, Ammonium chloride, Belladonna, Tobacco, Conium, Cardiac sedatives, Digitalis, Cocaine), ... 170

ORDER 3.—*Oxytocics*—(Ergot, Hydrastis, Hydrastinine hydrochlorate, Cotton-root bark, Quinine), ... 170–174

ORDER 4.—*Uterine Sedatives*—(Opium, Cannabis Indica, the Bromides, Chloral, Tartar emetic, Ether, Viburnum prunifolium), ... 174–175

ORDER 5.—*Emmenagogues*—(Preparations of Iron, of Arsenic, and of Manganese, Myrrh, Aloes, the Salines, Potassium permanganate, Savine, Tansy, Apiol, Cantharides, Guaiac), ... 175–177

(*d*) ON THE ALIMENTARY CANAL, ... 177–202

ORDER 1.—*Emetics*—(Ipecac, Apomorphine, Mustard, Zinc sulphate, Copper sulphate, Alum, Turpeth mineral, Tartar emetic), ... 177–181

ORDER 2.—*Gastric Sedatives*—(Calomel, Ice, Lime-water, Brandy, Morphine, Diluted hydrocyanic acid, Creasote, Bismuth, Carbolic acid, Thymol, Sulphurous acid, the Sulphites, Charcoal, the Bromides, Nux vomica, Cereum

PAGES

oxalate, Ipecac (minute doses), Fowler's solution, Counter-irritation), ... 181–182

ORDER 3.—*Carminatives*—(Asafetida, Eucalyptus, Ether, Capsicum, Pepper, Cinnamon, Nutmeg, Mace, Cloves, Allspice, Ginger, Cardamoms, Aromatic powder, Aromatic fluid extract, Oil of cajuput, Calamus, Oil of gaultheria, Oil of lavender flowers, Peppermint, Spearmint, Oil of rosemary, Pennyroyal, Horehound, Sage, Oil of thyme, Fennel, Caraway, Anise, Coriander, Star anise, Orange-peel, Orange-flowers, Vanilla, Oil of turpentine), ... 182–188

ORDER 4.—*Cathartics*—(Tamarinds, Manna, Cassia fistula, Frangula, Cascara sagrada, Castor oil, Sulphur, Sulphurated potassa, Rhubarb, Juglans, Aloes, Senna, Leptandra, Euonymus, Mercurials, Magnesia, Magnesium carbonate, Epsom salt, Effervescent magnesium citrate and its solution, Glauber's salt, Sodium phosphate and pyrophosphate, Potassium sulphate, Potassium bitartrate, Rochelle salt, Seidlitz powder, Manganese sulphate, Jalap, Bryony, Podophyllum, Iris, Tetterwort, Scammony, Colocynth, Gamboge, Compound cathartic pills, Vegetable cathartic pills, Elaterin, Croton oil, Enemata), ... 188–199

ORDER 5.—*Anthelmintics*—(Spigelia, Chenopodium, Santonica and Santonin, Aspidium, Pomegranate and Pelletierine, Cusso, Pumpkin-seed, Kamala, Oil of turpentine, Calomel, Sulphur, Infusion of quassia, Sodium chloride, Naphtol, Tannin, Alum-water, Lime-water, Injections of sweet oil), ... 199–202

CLASS III.—MEDICINES ACTING ON THE BODY BY THEIR EFFECT ON THE VARIOUS SECRETIONS AND EXCRETIONS, ... 202–244

ORDER 1.—*Diuretics*—(Solution of potassa, Potassium carbonate, Potassium bicarbonate, Potassium citrate, Potassium acetate, Cream of tartar, Potassium nitrate, Potassium chlorate, Lithium carbonate, Lithium citrate, Lithium benzoate, Sodium acetate, Strontium lactate, Squill, Digitalis, Caffeine, Sodio-theobromine salicylate, Apocynum, Broom, Dandelion, Sweet spirit of nitre, Mercurials, Buchu, Pareira, Uva ursi, Chimaphila, Triticum, Juniper, Oil of erigeron, Oil of santal, Corn-silk, Turpentine, Copaiba, Cubeb, Matico, Cantharides), ... 202–217

PAGES

ORDER 2.—*Diaphoretics*—(Ipecac, Dover's powder, Antimonials, Aconite, Veratrum viride, Salicylic acid, Potassium citrate, Spirit of mindererus, Sweet spirit of nitre, Pilocarpus), ... 217–221

ORDER 3.—*Expectorants*—(Ipecac, Apomorphine, Tartar emetic, Pilocarpine, Lobelia, Grindelia, Ammonium chloride, Senega, Quillaja, Quebracho, Asclepias, Eriodictyon, Garlic, Sanguinaria, Ammoniac, Benzoin, Peruvian balsam, Balsam of tolu, Tar, Terpin hydrate, Terebene, Squill, Turpentine, Eucalyptus, Serpentaria, Prunus Virginiana), 221–228

ORDER 4.—*Astringents*—(Tannic acid, Gallic acid, Nutgalls, Catechu, Kino, Krameria, Logwood, White oak bark, Geranium, Witch-hazel, Red and pale rose, Sumach, Chestnut leaves, the Lead salts, Alum, Aluminum sulphate, the Salts of copper, of zinc, of silver, and of bismuth, Cerium oxalate), ... 228–241

ORDER 5.—*Antacids*—(Solution of potassa, Spirit and aromatic spirit of ammonia, Solution of soda, Sodium carbonate, Sodium bicarbonate, Lime-water, Syrup of lime, Precipitated calcium carbonate, Prepared chalk and its preparations), ... 241–244

GROUP II.—TOPICAL MEDICINES, ... 244–269

CLASS I.—ANTISEPTICS.—(Solution of hydrogen dioxide, Potassium permanganate, Chlorine-water, Chlorinated lime, Labarraque's solution, Mercuric chloride, Bromine, Iodine, Mercuric oxide, Iodoform, Iodol, Sulphurous acid, the Sulphites and sulphides, Boric acid and the borates, Iron sulphate, Lead nitrate, Carbolic acid and the carbolates, Creasote, Benzoic acid and the benzoates, Naphtalin, Naphtol, Formaldehyd, the Antipyretics, Antiseptic oils, Thymol), . 244–256

CLASS II.—IRRITANTS, ... 256–262

ORDER 1.—*Rubefacients*—(Mustard, Capsicum, Oil of turpentine, Ammonia, Burgundy pitch, Canada pitch), . . 256–258

ORDER 2.—*Vesicants*—(Cantharides, Potato-bug, Ammonia), ... 258–259

ORDER 3.—*Pustulants*—(Croton oil, Antimonial ointment), ... 259–260

PAGES

ORDER 4.—*Escharotics*—(Caustic potash, Caustic soda, Arsenious acid, Bromine, Zinc chloride, Acid nitrate of mercury, Corrosive sublimate, Potassium bichromate, the Mineral acids, Silver nitrates, Copper sulphate, Alum), . . 260–262

CLASS III.—DEMULCENTS—(Water, Acacia, Tragacanth, Slippery elm-bark, Marshmallow, Flax-seed, Sassafras pith, Quince-seed, Liquorice-root, Iceland moss, Irish moss, Starch, Isinglass), ... 263–266

CLASS IV.—EMOLLIENTS—(Lard, Lanolin, Suet, Spermaceti, Wax, Oleic acid, Glycerine, Cacao-butter, Cotton-seed oil, Oil of benne, Petrolatum, the Demulcents), . . . 266–267

CLASS V.—PROTECTIVES—(Plasters, Ointments, Plaster of Paris, Collodion, India-rubber, Solution of sodium silicate), ... 268–269

CLASS VI.—COLORING AGENTS—(Cochineal, Saffron, Red saunders), ... 269

INDEX, ... 271

QUESTIONS AND ANSWERS

ON THE

ESSENTIALS OF MATERIA MEDICA AND THERAPEUTICS.

What is meant by the term "materia medica"?

Materia medica is that division of medical science which treats of all that relates to the medicines employed in the treatment of disease. It embraces the study of the source of remedies, their physical and chemical properties, their action in medicinal doses on the human body both in health and disease, their poisonous effects and the means by which they may be antagonized, and the methods of preparing and administering them; and is closely allied to botany, mineralogy, zoölogy, chemistry, physiology and pathology.

How may this knowledge be subdivided?

Into *Materia Medica Proper*, *Pharmacy*, *Pharmacology* including *Toxicology*, and *Therapeutics*.

What is materia medica proper?

By materia medica proper is understood a description of the source, and the physical and chemical characteristics of remedies.

What is pharmacy?

Pharmacy (*φάρμακον*, a medicine) relates to the preparation and combination of remedies.

What is pharmacology?

Pharmacology (*φάρμακον*, a medicine, and *λόγος*, a discourse), though originally meaning a "treatise on drugs" or "on pharmacy," is now usually applied only to the study of the action of drugs on the body, and embraces toxicology (*τοξικόν*, poison with which arrows are smeared, and λόγος, a discourse), which deals with poisons and their antidotes.

What are therapeutics?

Therapeutics (θεράπευω, I take care of, or, cure) deals with the application of remedies to disease, and may be either *empirical* or *rational*.

How does empirical differ from rational therapeutics?

When a remedy is given in any disease because it has succeeded in similar cases before, although the manner in which it acts is often not understood, it is given empirically. When a remedy is prescribed because, from a knowledge of its action on the body, it is likely that it will antagonize or overcome a particular pathological condition, it is administered on the rational plan. Rational therapeutics is the more scientific, and is the outgrowth of pharmacology.

What are remedies?

Remedies are the agents employed in the treatment of disease.

How may remedies be classified?

Remedies are subdivided into *mechanical*, *physical*, *dietetic*, *hygienic* and *pharmaceutical* agents. The first four classes are usually treated of in works especially devoted to such subjects.

What are mechanical remedies?

Venesection; local bloodletting by means of leeches, cups, scarifications, incisions or punctures; bandages; splints; sutures; ligatures; acupressure needle and forceps; acupuncture; aspiration; frictions; massage, etc., are mechanical remedies and are described in works on surgery.

What are physical remedies?

When light, heat or cold, electricity, galvanism or other of the physical forces are used in the treatment of disease, they are spoken of as *physical remedies*. They are treated of at length in works on physics and in books devoted to them exclusively.

What is meant by dietetic remedies?

All relating to the food of the sick* or to special plans of diet, are included under this head.

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* In many diseases the diet is of equal or of more importance than medication, *e. g.*, in diabetes mellitus, and in various forms of dyspepsia.

What are hygienic remedies?

The clothing, bathing and cleanliness of the sick, the ventilation of the sick room, etc., belong to this subdivision, and will be found in works on practice of medicine, but more particularly in those relating to hygiene.

What are pharmaceutical remedies?

Pharmaceutical remedies or "medicines, are substances not essentially alimentary, which, when applied to the body, so alter or modify its vital functions as to be rendered applicable to the treatment of diseases." * It is preëminently with this subdivision that materia medica deals.

What is meant by "official" preparations?

This term is applied to such remedies as are authorized (*officialis*) by the Pharmacopœia.

How does a pharmacopœia differ from a dispensatory?

A *pharmacopœia* (*φάρμακον*, a medicine, and *ποίεω*, to make) is a book containing directions for the preparation of medicines with the object of uniformity of nomenclature, preparation and strength. The U. S. Pharmacopœia has been decennially revised since 1820, when it was first authorized by a representative convention of druggists and physicians, held at Washington. It is an authoritative list of remedies, with formulæ for such preparations as may be in general use. "A *dispensatory* differs from a pharmacopœia in containing the physical and medical history of the various substances." It "contains the whole of the pharmacopœia" "with additions by the author, under whose authority alone it usually appears" (Dunglison). It treats, also, of the therapeutics, modes of administration and doses of the various drugs, "while the pharmacopœia is restricted to the mode of preparing them."

How may the official preparations be classified?

They may be classified, according to their physical state, into *solids*, *semi-solids*, and *liquids*.

Name the official solid preparations.

Lozenges, papers, pills, powders, and triturations.

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* Biddle's Materia Medica, 11th Ed., 1889, p. 46.

What are the official semi-solid preparations?

Confections, extracts, cerates, liniments, oleates, ointments, plasters, and suppositories.

Mention the official liquid preparations.

Solutions, mixtures, waters, infusions, decoctions, tinctures, spirits, wines, glycerites, fluid extracts, honeys, syrups, vinegars, and oleoresins.

What are lozenges?

Lozenges or troches (*trochisci*) are dry, solid medicines made of powders incorporated usually by means of mucilage and sugar, intended to be slowly dissolved in the mouth.

What are papers?

Papers (*chartæ*) are made by soaking bibulous paper in medicinal solutions (*e.g.*, charta potassii nitratis), or by spreading medicinal mixtures on paper (*e.g.*, charta sinapis).

What are pills?

Pills (*pilulæ*) are preparations of such size that they can be conveniently swallowed whole. They usually contain some excipient to give the proper degree of tenacity to their particles, and are rolled into a spherical form.

What are powders?

Powders (*pulveres*) are dry solid medicines in a minute state of subdivision.

What are triturations?

Triturations (*triturationes*) consist of 1 part of a medicinal substance and 9 parts of sugar of milk thoroughly mingled and reduced to a fine powder in a mortar.

What is a confection?

Confections or conserves (*confectiones*) are remedies made into a soft mass with sugar, honey, etc., which render them more pleasant to the taste.

What are extracts?

Extracts (*extracta*) are made by evaporating solutions of vegetable substances (or in some cases the juices expressed from plants) to a pilular consistence. They are called aqueous or watery, alcoholic and acetous extracts, according to the menstruum used as a solvent

What are cerates?

Cerates (*cerata*) are unctuous preparations, intended for external application, mixed with wax, spermaceti or resin, which gives them a firm consistence, and prevents them from melting at the temperature of the body.

What are liniments?

Liniments (*linimenta*) are oleaginous preparations, intended for external application with friction.

What are oleates?

Oleates (*oleata*) are solutions in oleic acid of metallic salts or alkaloids, and are applied externally.

What are ointments?

Ointments or unguents (*unguenta*) are medicaments incorporated with some fatty substance, and intended for external use. They are of the consistence of lard.

What are plasters?

Plasters (*emplastra*) are preparations spread on linen, muslin, silk or sheepskin, and are intended to adhere closely to the surface to which they are applied.

What are suppositories?

Suppositories (*suppositoria*) are made by incorporating medicinal substances with oil of theobroma, and are intended for introduction into the rectum or vagina. They are of conical form, to facilitate their insertion.

What are solutions?

Solutions (*liquores*) are preparations in which a non-volatile substance is entirely dissolved in the menstruum (usually water).

What are mixtures?

Mixtures (*misturæ*) are preparations in which, by means of some viscid substance, an insoluble medicine is suspended in water.

What are waters?

Waters (*aquæ*) are aqueous solutions of gaseous or volatile substances.

What are infusions?

Infusions (*infusa*) are aqueous preparations obtained by *pouring* hot or cold water on vegetable substances and allowing it to remain sufficiently long to extract the virtues of the drug.

What are decoctions?

Decoctions (*decocta*) are aqueous preparations obtained by *boiling* vegetable substances in water for a few minutes and allowing them to cool in closely-covered vessels.

What are tinctures?

Tinctures (*tincturæ*) are alcoholic solutions, usually of non-volatile substances. Alcohol or diluted alcohol is generally used as a solvent, but occasionally the aromatic spirits of ammonia is employed, the product being called an *ammoniated tincture.*

What are spirits?

Spirits (*spiritus*) are alcoholic solutions of gaseous or volatile substances.

What are wines?

Wines (*vina*) are tinctures made with stronger white wine instead of alcohol.

What are glycerites?

Glycerites (*glycerita*) are medicinal substances mixed with glycerin.

What are fluid extracts?

Fluid extracts (*extracta fluida*) are liquid preparations of uniform strength, 1 c.c. of which represent 1 Gm. (about 1 minim to the grain) of the crude drug, prepared chiefly with alcohol and glycerin.

What are honeys?

Honeys (*mellita*) are medicines dissolved in honey.

What are syrups?

Syrups (*syrupi*) are composed of *medicinal* substances, or of *flavoring* ingredients in sugar and water. *Simple syrup* is a concentrated solution of sugar in water.

What are vinegars?

Vinegars (*aceta*) are medicinal solutions in diluted acetic acid.

What are oleoresins?

Oleoresins (*oleoresinæ*) are concentrated extracts consisting chiefly of the resin dissolved in the oil of the drug from which they are obtained.

May medicines be prescribed in other forms than those referred to above?

Medicines are often administered in *capsules* (small, elongated gelatine boxes with rounded ends, which dissolve readily in the stomach), *granules* or *parvules* (very minute pills), *emulsions* (oils or resins suspended in a mixture by means of some viscid material), *enemata* (liquids injected into the rectum for their local or systemic effect), or *injections* (liquids forced by a syringe into the mucous passages or cavities, under the skin or into a blood vessel). *Inhalations* of vapors may be employed for their local effect on the broncho-pulmonary tract or for their influence on the system at large, and *gargles* may be used as sedative, astringent or disinfecting and deodorizing applications to the buccal and pharyngeal mucous membranes. Externally, *poultices* (simple or medicated), *lotions* (washes), and *fomentations* (hot lotions applied on flannel or cloth and allowed to remain in contact with the surface), are also often used.

What weights and measures are used in prescribing and dispensing medicines?

Troy or apothecaries' weight is used in dispensing solids, while *wine or apothecaries' measure* is employed for liquids; occasionally the *metrical system* is used in prescribing.

What is apothecaries' weight?

In apothecaries' weight the pound is divided into ounces, drachms, scruples and grains, as follows:—

20 grains (gr.) = 1 scruple (℈).
60 grains or 3 scruples = 1 drachm (ʒ).
480 grains or 24 scruples or 8 drachms = 1 ounce (℥).
5760 grains or 288 scruples or 96 drachms or 12 ounces = 1 pound (℔).

The grain (gr.), drachm (ʒ) and ounce (℥) should alone be used in prescription writing.

What is wine measure?

In wine measure the gallon is divided into pints, flui-ounces, flui-drachms and minims, thus:—

60 minims (♏) = 1 flui-drachm (fʒ).
480 minims or 8 flui-drachms = 1 flui-ounce (f℥).
7680 minims or 128 flui-drachms or 16 flui-ounces = 1 pint (O).
61440 minims or 1024 flui-drachms or 128 flui-ounces or 8 pints = 1 gallon (C).

The minim (♏), flui-drachm (fʒ), flui-ounce (f℥) and, very seldom, the pint (O) are used in prescriptions.

Describe the metrical system of weights.

In the *metrical or decimal system* the gramme is multiplied or divided by ten, Greek prefixes denoting the multiplication, and Latin the subdivisions of the unit; thus:—

10 milligrammes = 1 centigramme.
100 milligrammes, or 10 centigrammes = 1 decigramme.
1000 milligrammes, or 100 centigrammes, or 10 decigrammes = 1 gramme.
10,000 milligrammes, or 1000 centigrammes, or 100 decigrammes, or 10 grammes = 1 decagramme.
100,000 milligrammes, or 10,000 centigrammes, or 1000 decigrammes, or 100 grammes, or 10 decagrammes = 1 hectogramme.
1,000,000 milligrammes, or 100,000 centigrammes, or 10,000 decigrammes, or 1000 grammes, or 100 decagrammes, or 10 hectogrammes = 1 kilogramme.

In writing prescriptions in the metrical system, the gramme (Gm.) alone is used for both solids and fluids, the abbreviation being *preceded* by *Arabic figures* or decimals denoting the amount of the drug (*e. g.*, 10.0 Gm.-0.02 Gm., etc.).

What is a gramme?

The gramme is the weight of a cubic centimeter (c. c.) of distilled water at 4° C. (39.5° F.).

What is a centimeter?

A centimeter ($\frac{4}{10}$ of an inch) is the $\frac{1}{100}$ of a metre (39.37 inches), which is the ten-millionth part of a quarter of a meridian of the earth (or of the distance from the pole to the equator).

What relation does the metrical system of weights bear to apothecaries' weight and measure?

1 gramme = 15.5 grains; 1 decigramme (0.1 Gm.) = 1.5 grains; 1 centigramme (0.01 Gm.) = .15 (or $\frac{1}{6}$) grain; 1 milligramme (0.001 Gm.) = .015 (or $\frac{1}{64}$) grain; 1 grain (gr.j) = .06 gramme; 1 drachm (ʒj) = 4.0 grammes (approximately); 1 ounce (℥j) = 32.0 grammes (approximately).

The following table gives the value of grains in the metrical system. (The fractions have not been carried out beyond the fourth decimal point.)

Grains		Grammes	Grains		Grammes
$\frac{1}{100}$	=	0.0006	3	=	0.194
$\frac{1}{50}$	$\doteq$	0.0013	4	=	0.259
$\frac{1}{25}$	=	0.0027	5	=	0.324
$\frac{1}{8}$	=	0.008	10	=	0.648
$\frac{1}{4}$	=	0.016	30 or ʒss	=	1.944
$\frac{1}{2}$	=	0.032	60 or ʒj	=	3.888
$\frac{3}{4}$	=	0.049	120 or ʒij	=	7.775
1	=	0.065	240 or ℥ss	=	15.551
2	=	0.130	480 or ℥j	=	31.103

As the weight of a c. c. of fluid depends upon its density, 1.0 Gm. of a light liquid (*e. g.*, alcohol) will measure more than the same weight of a heavy liquid (*e. g.*, glycerin). Approximately, however, ♏j = 0.06 Gm.; fʒj = 4.0 Gm. (a little less), and f℥j = 32.0 Gm. (a little less).

The following table gives the value of minims (of water at 4° C. in vacuo) in the metrical system. For ordinary purposes these values may be used without correction.

Minims		Grammes	Minims		Grammes
1	=	0.06161	20	=	1.232
2	=	0.123	30 or fʒss	=	1.848
3	=	0.185	60 or fʒj	=	3.696
4	=	0.246	120 or fʒij	=	7.393
5	=	0.308	240 or f℥ss	=	14.786
10	=	0.616	480 or f℥j	=	29.573
15	=	0.924	960 or f℥ij	=	59.147

What approximate measurements are used in medicine?

Medicines are sometimes ordered in *drops* instead of minims. As the size of the drop depends on a variety of circumstances, this is a bad practice. A *teaspoonful* is often used for fʒj, or 5.0 Gm.; a *tablespoonful* for f℥ss, or 20.0 Gm.; a *wineglassful* for f℥ij; but these are uncertain measures, and should only be employed when an excess of the quantity intended would be harmless. Graduated medicine glasses are easily obtained, and are much more reliable.

May a physician prescribe other formulæ than those contained in the Pharmacopœia?

The physician often extemporizes formulæ to meet the requirements of the individual case.

For what purposes are different remedies often combined in a single prescription?

Remedies are combined to increase or to moderate the effects of some single medicine, or to overcome some action which it is undesirable to produce; to procure the simultaneous action of drugs having different effects upon the body, or to form a new chemical compound, often differing in its action from those of the substances forming it; for convenience in administering, or for rendering nauseous drugs more palatable.

What precautions should be used in prescription writing?

The physician should be careful, while writing the prescription,—

1. To bear constantly in mind the object for which the medicine is wanted, in order that he may better combine his remedies to accomplish his purpose.

2. The writing should be clear and distinct, and the words not so abbreviated as to be unintelligible or susceptible of more than one meaning. Attention to these points will prevent the occurrence of mistakes in compounding the medicine.

3. The doses should neither be large enough nor close enough together (in the case of powerful medicines) to cause injurious effects. It is better to give too little than too much.

4. Medicines which form poisonous compounds (as calomel and sodium chloride) should not be combined in the same prescription.

5. Remedies should not be combined (except for particular pur-

poses) which are physiological antagonists, *i. e.*, which by their actions on the body render each other inert.

6. Remedies should not be combined for internal administration which are chemically incompatible, *i. e.*, which will decompose or precipitate each other.

7. The prescription should be as simple as possible, and contain as few ingredients as the nature of the case will allow.

8. It is better not to order a larger quantity of medicine than the patient will probably require.

9. Never send out a prescription without having carefully reread it, to be certain no mistake has been made.

10. Never give a patient a prescription which has been corrected. If a mistake has been made, rewrite the prescription entirely.

Of what parts does a prescription consist?

A prescription consists of four parts:—

1st. The *superscription* (*super*, "over," and *scribo*, "I write"), which consists of the sign ℞ (which is possibly an abbreviation for *Recipe*, "take"), and in some cases the name and address of the patient, with the date.

2d. The *inscription*, the body of the prescription, containing the names of the drugs which are to be used, with the amount of each.

3d. The *subscription* (*sub*, "under," and *scribo*, "I write"), the directions to the apothecary regarding the preparation of the medicine.

4th. The *signature*, commencing with *S.* or *Sig.* (*Signa*, "write"), and including directions for taking the medicine, the physician's name, and frequently the date, which may be placed here instead of at the beginning of a prescription.

It is customary to write the superscription and signature in English and the inscription and subscription in much abbreviated *medical Latin.*

The *inscription* formerly consisted almost universally of a *basis* (the principal medicine), an *adjuvant* (to aid its action), a *corrective* (to prevent unpleasant effect), and a *vehicle.* Although inscriptions thus formed are still sometimes seen, particularly in purgative prescriptions, yet the tendency to simplicity in prescribing is increasing daily, and prescriptions are often found containing only the basis and the vehicle.

Is a knowledge of Latin necessary in writing a prescription?

A very limited knowledge of Latin is sufficient for ordinary prescription writing, because, owing to the common practice of abbreviating, the last syllable of the Latin words, which varies with the case, is generally omitted.

Describe the method of writing a prescription.

Having written the superscription,* the physician places the names of the drugs which he wishes to administer, in a vertical column under the sign ℞., writing them in Latin and in the genitive case. He next determines how many doses he wishes to prescribe, and multiplying the single dose of each drug by the total number of doses in the prescription, he sets the amount opposite the corresponding medicine, expressing the quantity by the proper signs and numerals if it is written in apothecaries' weight and measure, or by Arabic figures and abbreviations if written in grammes. Thus, having determined to prescribe an iron mixture containing 24 doses, he might write—

℞.	Tincturæ Ferri Chloridi, . .	fʒij	or	8	Gm.
	Acidi Acetici Diluti, ...	fʒj		4	"
	Liquoris Ammonii Acetatis,	f℥j		32	"
	Elixir Aromatici, ...	fʒxiij		52	"

Next comes the directions to the druggist, which in this case is simply to mix the medicines together and which is expressed by the Latin word *misce*, usually abbreviated to M.

Then follows Sig. or S. (signa), which means the druggist must write what follows on the label, as a direction for the patient, "Take one teaspoonful in water 3 times a day after eating," ending the prescription with the physician's name.

May the above prescription be written in any other way?

Instead of writing "Elixir Aromatici fʒxiij," he may write "Elixir Aromatici *quantum sufficit* f℥iij," which means "as much of the aromatic elixir as will suffice (to make the whole mixture measure) f℥iij."

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* The patient's name and address and the date are often omitted.

Why are the titles of the drugs written in the genitive case?

The verb "*recipe*" (℞., "take thou") governs not the drug, but the quantity to be taken, which is placed consequently in the accusative case ("take thou two drachms"); the name of the drug *limits* the meaning of the quantity expressed, and according to rule is placed in the genitive case and governed by the amount ("take thou two drachms" of what?—"of the tincture of the chloride of iron").

Given a prescription containing a number of doses of different ingredients, how may a single dose of any one drug be ascertained?

Calculate the number of doses in the mixture and divide the quantity of any ingredient by the number, the result is a single dose.

Thus, the above prescription is a f℥ iij mixture, of which the dose is a teaspoonful or fʒ j. As fʒ viij = f℥ j, there are 3 times fʒ viij or fʒ xxiv in the mixture, consequently 24 doses. To ascertain the amount of tincture of chloride of iron in each dose, convert the quantity of the tincture to minims and divide by 24: ♏60 = fʒ j, therefore ♏120 = fʒ ij; ♏120 ÷ 24 = ♏v, the quantity of the tincture in a single dose of the mixture.

How many doses should a mixture contain?

A physician should avoid prescribing more of a medicine than his patient will probably want. As a general rule, 24 doses is a sufficient amount, and forms a prescription in which the single doses of the ingredients are easily calculated.

Thus, if the dose be a teaspoonful (fʒ j), 24 doses would make a f℥ iij mixture (see above); if, however, the dose is a dessertspoonful (ʒ ij), 24 doses would be twice as much, f℥ vj. As ♏iiss × 24 = ♏60 or fʒ j, the latter amount represents 24 doses of ♏iiss each, and consequently, if an entire mixture contains 24 doses, fʒ j of any of its components will contain 24 doses of ♏iiss.

As solids, when in a thorough state of solution, are equally diffused throughout the menstruum, if ʒ j or gr. 60 of any solid is dissolved in 24 doses of a solution, each dose will contain gr. iiss of the solid. Hence, in prescribing—

1st, write for a f℥ iij mixture if the dose is to be a teaspoonful (fʒ j), or
" f℥ vj " " " " dessertspoonful (fʒ ij),

in either case the mixture will contain 24 doses.
2d, recollect that if each dose of such a mixture is to contain gr. iiss or ♏iiss of any substance, there should be ʒj or fʒj of the substance in the mixture;

if each dose should contain gr. v or ♏ v, there should be ʒij or f ʒij;
" " " gr. x or ♏ x, " " ℥ss or f ℥ss;
" " " gr. xx or ♏ xx, " " ℥j or f ℥j.

These rules simplify prescription-writing for beginners.

Can any general rule be formulated for dosage of official preparations?

As a general rule the *fluid extracts* may be prescribed in ♏x doses. (*Exceptions* (the poisons), the fluid extracts of aconite (♏ss–ij), belladonna (♏j–ij), colchicum root (♏ij–v), colchicum seed (♏ij–x), digitalis (♏j–ij), nux vomica (♏j–v), sanguinaria (♏j–v), squill (♏j–ij), stramonium (♏j), veratrum viride (♏j–iv).) *Infusions* and *decoctions* in f℥ss–f℥ij doses. (*Exception*, infusion of digitalis, fʒj–iv.) *Syrups*, fʒj–fʒij doses. (*Exceptions*, syrup of the iodide of iron, ♏v-xxx; compound syrup of squill, ♏x–xxx.) *Tinctures*, ♏v–fʒj doses. (*Exceptions* (the poisons), tinctures of aconite, ♏ij–iij; belladonna, ♏viij–xxx; colchicum, ♏v–xxx; digitalis, ♏v–x; iodine, ♏j–x; ipacac and opium, ♏v–xv; nux vomica, ♏j–x; opium, ♏ij–x; deodorized opium, ♏ij–x; physostigma, ♏v–xv; squill, ♏v–xxx; stramonium, ♏v–xv; veratrum viride, ♏ij–x.) *Powders*, gr. ij–x. *Volatile oils*, gtt. j–ij.

Many preparations can be administered in larger doses than indicated by this general rule.

Mention some circumstances which, by modifying the effects, will influence the dose of medicines.

As the activity of a drug is increased or lessened by the age, sex, idiosyncrasy, constitution and habits of the patient, as well as by the condition of the digestive and absorbent systems, disease, and manner of administration, these circumstances must be considered in relation to dosage.

How does age influence the activity of a drug?

Children and old persons are more readily influenced by most drugs, particularly narcotics, than adults in the prime of life; but, as a rule, they bear larger *proportionate* doses of purgatives. No scheme for calculating the doses from the age of the patient alone can be relied on in practice.

What is Dr. Young's rule for calculating the dose for children?

Convert the child's age into a fraction by using the age itself as a numerator and the age + 12 as a denominator, the result being the proportion of the adult dose which should be administered to the child. Thus, at three years $\frac{3}{3+12}=\frac{3}{15}=\frac{1}{5}$ of that of the adult. At 21 years of age the full dose is given.

What is Dr. Cowling's rule?

Dr. Cowling proposed to divide the patient's *next birthday* by 24; thus, at three years the dose would be $\frac{4}{24}=\frac{1}{6}$ of that of the adult.

How may the dose for a child be more easily calculated in the metric system?

Dr. Lauder Brunton proposes to multiply the next birthday by 4 and divide the result by 100; or, what is the same thing, to multiply the full dose by the child's next birthday, then by 4, and remove the decimal point two places to the left. Thus, if the dose for an adult be 1. Gm., that for a child of 3 years will be $\frac{1\times4\times4}{100}=.160$ Gms.

How do sex, idiosyncrasy, constitution and habits influence medicinal effects?

Men generally bear larger doses of medicines than women. Many persons manifest idiosyncrasies with respect to certain drugs; thus, some are very susceptible to the poisonous effects of even minute doses of arsenic; others cannot take quinine or opium or belladonna or the iodides, and in others very dilute solutions of cocaine applied to the mucous membranes may cause alarming symptoms. As a rule, the larger and more robust the individual, the less easily is he influenced by drugs. When a medicine is habitually taken, the system becomes tolerant to it, and larger doses are required to produce any effect. This is especially the case with opium and purgatives.

In what way does the condition of the digestive and absorbent symptoms modify the effects of medicine?

During digestion, larger amounts of medicine are borne than can be taken fasting. In certain conditions of the alimentary canal, as in the third stages of yellow fever and of cholera, during a congestive chill of the gastro-enteric variety, or during profound opium narcosis, absorption from the stomach is slow, if it take place at all.

What effect does disease have upon the influence of medicines on the system?

In certain diseases great tolerance is manifested to medicine; thus, in peritonitis and cerebro-spinal fever enormous doses of opium are taken with advantage; in typhoid fever the tolerance to alcohol is marked.

Does the method of administration modify the effect of medicines?

It does: diuretics act more powerfully when much diluted; saline purgatives when concentrated. Usually medicines act more rapidly and powerfully when given by the mouth than when administered per rectum; still more so when injected under the skin, and most powerfully when injected into the blood.

How may medicines be administered?

Medicines may be administered by the *skin*, being either applied without friction (*enepidermic method*), or with friction (*epidermic method*), or else directly to the derma, which has been denuded by means of a blister (*endermic method*). They may also be given *hypodermically*, by means of a small syringe armed with a long, hollow needle. When thus administered, the dose should be from one-half to two-thirds of that which is required by the mouth, and the medicine should be in a thorough state of solution. Medicines are also applied to all the *mucous tracts* in the form of solutions, vapors (by atomization), powders (by insufflation), etc. The gastro-intestinal tract is most generally used when a systemic effect is desired, and the remedy is given either by the mouth or by the rectum. Suppositories and ointments are occasionally used per vaginam for their influence on the system. The broncho-pulmonary mucous membrane is used for the inhalation of vapors, as ether. *Intravenous injection is rarely practiced* except as a last resort.

How are medicines classified?

Medicines are usually classified either according to their physiological action or to their therapeutic uses. The latter is the better arrangement.

The difficulty of grouping medicines is increased by the fact that even as yet the study of pharmacology is in its infancy, so that the exact physiological group to which many of them belong is not definitely determined. The action of most medicines, also, is complex, affecting different organs at the same time, and in many instances varying much according to the dose and the manner of administration.

They may be divided accordingly into—

GROUP 1.—SYSTEMIC MEDICINES.

Class 1.—Medicines acting on the body at large by their influence on digestion, nutrition (tissue waste and repair), and calorification.

Order I. Digestants. *Order II.* Tonics. *Order III.* Alteratives. *Order IV.* Antipyretics.

Class 2.—Medicines acting on the body by their effect on its various organs.

A. On the Nervous System:—

Order I. Hypnotics. *Order II.* Mydriatic Anodynes. *Order III.* Anæsthetics. *Order IV.* Antispasmodics. *Order V.* Excito-motors. *Order VI.* Depresso-motors.

B. On the Organs of Circulation:—

Order I. Stimulants. *Order II.* Sedatives.

C. On the Sexual Organs:—

Order I. Aphrodisiacs. *Order II.* Anaphrodisiacs. *Order III.* Oxytocics. *Order IV.* Uterine Sedatives. *Order V.* Emmenagogues.

D. On the Alimentary Canal:—

Order I. Emetics. *Order II.* Gastric Sedatives. *Order III* Carminatives. *Order IV.* Cathartics. *Order V.* Anthelmintics.

Class 3.—Medicines Acting on the Various Secretions:—

Order I. Diuretics. *Order II.* Diaphoretics. *Order III.* Expectorants. *Order IV.* Astringents. *Order V.* Antacids.

GROUP 2.—TOPICAL MEDICINES.

- *Class 1.* Antiseptics.
- *Class 2.* Irritants.
  - *Order I.* Rubefacients. *Order II.* Vesicants. *Order III.* Suppurants. *Order IV.* Escharotics.
- *Class 3.* Demulcents.
- *Class 4.* Emollients.
- *Class 5.* Protectives.
- *Class 6.* Coloring Agents.

GROUP I.—SYSTEMIC MEDICINES.

Class I.—Medicines Acting on the Body at Large by Their Influence on Digestion, Nutrition (Tissue Waste and Repair) or Calorification.

ORDER I.—DIGESTANTS.

What are digestants?

Digestants are animal or vegetable substances given to aid digestion when the normal alimentary secretions are insufficient for this function.

Name the digestants.

1. *Pepsinum* (*pepsin*), a proteolytic ferment obtained from the glandular layer of fresh stomachs from healthy pigs.

2. *Ingluvin*, a preparation from the gizzard of the domestic chicken.

3. *Pancreatinum* (*pancreatin*), a mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog (*sus scrofa*).

4. *Papain*, a ferment obtained from the fruit of Carica papaya (*Nat. Ord.* Papayaceæ), a tree of South America.

What are the physiological actions of these substances?

1. *Pepsin* (when combined with an acid) digests albumen, which it converts into albuminose.

2. *Ingluvin* also aids the digestion of albumen, this action being probably due to a bitter principle which it contains and which stimulates the gastric glands.

3. *Pancreatin* (in neutral or alkaline solutions) converts albumen into albuminose and starches into glucose and aids in emulsifying fats.

4. *Papain* digests albumen and dissolves false membranes, ascarides and tænia.

What are the therapeutic uses of the digestants?

1. *Pepsin* is useful when the secretion of the peptic glands is not sufficient for the purposes of digestion, as in *atonic dyspepsia*, *apep-*

sia of infants, *anœmia*, *chlorosis*, *gastric ulcer* and *cancer* and *infantile diarrhœa*. It has been used for the relief of *reflex vomiting*, as that of *pregnancy*. It is an invaluable addition to nutritive enemata, and has been *injected into tumors* to arrest their growth and aid in their absorption.

2. *Ingluvin* is used chiefly for the relief of *vomiting of pregnancy*, also in *indigestion accompanied with flatulency*, and in *acute dyspepsia*.

3. *Pancreatin* is used in *intestinal indigestion*, and to aid in emulsifying fats. It is also added to nutritive enemata.

4. *Papain* is sometimes used in *dyspepsia*, to aid the digestion of albuminous foods, but more frequently for its solvent action on *false membranes* and *tœnia*.

Pepsin, *pancreatin* (under the name of *trypsin*) and *papain* have been successfully used to *dissolve the membranes of croup and diphtheria*. They are used in solution, either in the form of spray or applied by a brush to the part.

What are the preparations and doses of the digestants?

Pepsinum saccharatum (*saccharated pepsin*) should digest 300 times its own weight of freshly coagulated and disintegrated egg-albumen, dose gr. v–xxx (0.3–2.0).

Ingluvin (not official) may be given in doses of gr. v–xv (0.3–1.0).

Pancreatinum (*pancreatin*) in doses of gr. v–xv (0.3–1.0).

Papain (not official) in doses of gr. j–v (0.065–0.49).

Name some of the substances which are incompatible with the digestants.

Alcohol and many of the *mineral salts* destroy their properties.

Alkalies (when sufficiently powerful) interfere with the action of pepsin and ingluvin, while materially aiding that of pancreatin.

Acids retard and finally destroy the action of pancreatin while aiding those of pepsin and ingluvin.

How and at what time should the digestants be given?

Pepsin and ingluvin should be given with meals, either in solution with an acid or in capsules, powder or compressed pill.

Often they are combined with sodium bicarbonate, to which bismuth is sometimes added, and administered before eating.

Pancreatin is usually given from 2 to 4 hours after meals, combined with an alkali.

Papain is taken after meals, in powder, capsule or compressed pill.

ORDER II.—TONICS.

What are tonics?

Tonics are remedies which, in conditions of debility, impart a gradual and permanent increase of vigor to the body or its various parts, restoring the energy and strength which were wanting.

How may tonics be divided?

They may be divided into *vegetable* and *mineral tonics.*

VEGETABLE TONICS.

What subdivisions of vegetable tonics are made?

VEGETABLE TONICS are divisible into *simple or pure bitters, aromatic bitters* and *peculiar bitters.*

Simple Bitters.

Mention the simple bitters.

1. QUASSIA, the *wood* of Picræna excelsa (*Nat. Ord.* Simarubeæ, a lofty tree of the West Indies.
2. GENTIANA (*gentian*), the *root* of the Gentiana lutea (*Nat. Ord.* Gentianeæ), a plant of the mountainous portions of Central and Southern Europe.
3. CALUMBA, the *root* of Jateorrhiza palmata (*Nat. Ord.* Menispermaceæ), a plant of the southeastern coast of Africa.
4. CHIRATA, Swertia chirata (*Nat. Ord.* Gentianeæ), a *plant* of India.

What are their chief chemical constituents?

1. *Quassia-wood* contains *quassin*, a neutral bitter principle ;
2. *Gentian*, an acid, *gentisic acid* (gentisin) ; a fixed oil, and a bitter principle, *gentianin* or *gentiopicrin ;*
3. *Calumba*, an alkaloid, *berberine* (which is found in many other plants, and has been used as a tonic and febrifuge) ; a bitter principle, *columbin*, and an acid, *columbic acid ;* and

4. *Chirata*, a neutral bitter principle, *chiratin;* and an amorphous acid, *ophelic.*

What are the physiological actions of the simple bitters?

The simple bitters increase the secretions, and impart tone to the mucous membranes; increase the appetite and digestion, and thus promote nutrition and improve the condition of the blood, but when taken continuously for too long a time they disorder digestion and cause gastric catarrh. Gentian, in full doses, by increasing the intestinal secretion, acts as a mild laxative.

Calumba is least likely to disorder the stomach.

What are the therapeutic uses of the simple bitters?

They are given (1) to *increase secretion* and *promote appetite* in *atonic dyspepsia*, in *chronic gastric catarrh* and during *convalescence* from acute diseases. Calumba is the mildest, and, being best adapted to weak stomachs, may be used in *vomiting of pregnancy* and in *seasickness;* quassia, gentian and chirata are well adapted to cases of dyspepsia with relaxation or torpor of the mucous membrane and resulting constipation. (2) *To give tone to the mucous membranes*, in *diarrhœa* and in *accumulations of flatus* in the bowel from a relaxed condition, calumba may be used. (3) *As vehicles* for the administration of other medicines, as acids or alkalies. (4) *To destroy ascarides*, an infusion of quassia may be used as an enema.

What are the preparations and doses of these substances?

1. EXTRACTUM QUASSIÆ (*extract of quassia*), dose gr. j–v (0.065–0.5), principally used as an excipient.

EXTRACTUM QUASSIÆ FLUIDUM (*fluid extract of quassia*), dose ♏v–xxx (0.308–1.848).

TINCTURA QUASSIÆ (*tincture of quassia*), f ʒj–ij (4.0–8.0).

Quassin (not official), dose gr. ¼–½ (0.016–0.032).

2. EXTRACTUM GENTIANÆ (*extract of gentian*), dose gr. j–xxx (0.065–2.0).

EXTRACTUM GENTIANÆ FLUIDUM (*fluid extract of gentian*), dose f ʒss–j (2.0–4.0).

TINCTURA GENTIANÆ COMPOSITA (*compound tincture of gentian*), dose f ʒss–ij (2.0–8.0).

3. EXTRACTUM CALUMBÆ FLUIDUM (*fluid extract of calumba*), dose f ʒss–j (2.0–4.0).

TINCTURA CALUMBÆ (*tincture of calumba*), dose fʒss–ij (2.0–8.0).

Berberine (not official), dose gr. j–x (0.065–0.648) as a sulphate or hydrochlorate.

4. EXTRACTUM CHIRATÆ FLUIDUM (*fluid extract of chirata*), dose ♏x–xx (0.616–1.3).

TINCTURA CHIRATÆ (*tinctura of chirata*), dose ♏v–fʒj (0.308–4.0).

What medicines should not be prescribed with gentian?

Iron sulphate and the salts of silver and of lead are incompatible with gentian.

How and at what time should the simple bitters be given?

The simple bitters are given before eating, either alone or combined with other medicines in pills or in mixtures or solutions.

Aromatic Bitters.

How do the aromatic differ from the simple bitters?

The aromatic bitters are more *stimulating* to the mucous tract than the simple bitters, because of the aromatic volatile oils which they contain; they also contain tannic or gallic acid, which renders them more or less *astringent.*

Mention the aromatic bitters.

1. SERPENTARIA (*Virginia snakeroot*), the *rhizome* and *rootlets* of Aristolochia serpentaria (*Nat. Ord.* Aristolochiaceæ) and other varieties of Aristolochia, indigenous plants;

2. EUCALYPTUS, the *leaves* of E. globulus or blue gum-tree (*Nat. Ord.* Myrtaceæ), a tree of Australia;

3. PRUNUS VIRGINIANA, the *bark* of P. serotina or wild cherry (*Nat. Ord.* Rosaceæ), an indigenous tree;

4. ANTHEMIS, the *flower-heads* of A. nobilis or chamomile (*Nat. Ord.* Compositæ), a native of Europe;

5. MATRICARIA, the *flower-heads* of M. Chamomilla or German chamomile (*Nat. Ord.* Compositæ);

6. EUPATORIUM, the *leaves* and *flowering tops* of E. perfoliatum, boneset or thoroughwort (*Nat. Ord.* Compositæ), a common indigenous plant;

7. CASCARILLA, the *bark* of Croton Eluteria (*Nat. Ord.* Euphorbiaceæ), a small tree of the West India Islands; and

8. ABSINTHIUM, the *leaves* and *tops* of Artemisia Absinthium or wormwood (*Nat. Ord.* Compositæ), a European plant.

What are the chief chemical constituents of the aromatic bitters?

They all contain a *volatile oil*, a *bitter principle*, *resin* and *tannic acid*.

The *volatile oil of eucalyptus* is composed of two terpenes, cymol and eucalyptol; that of *Prunus Virginiana* contains hydrocyanic acid, which is formed by the reaction in water of a peculiar ferment (not emulsin) existing in the bark, with the bitter principle; that of *absinthium* contains absinthol.

The *bitter principle of serpentaria* is called *aristolochin;* that of *anthemis*, *anthemic acid;* that of *eupatorium*, *eupaturin;* that of *cascarilla*, *cascarillin;* and that of *absinthium*, *absinthin.*

What are the physiological actions of the aromatic bitters?

Owing to the bitter principles which they contain, their action on digestion, nutrition and secretion is similar to that produced by the simple bitters. They have, in addition, a stimulating influence on the mucous membranes, due to the volatile oils (which are eliminated by the bronchial mucous membrane, skin and kidneys, and increasing their secretions are, somewhat, expectorants, diaphoretics and diuretics), and an astringent effect, owing to their tannic acid. In large doses they are emetic and laxative. *The oil of eucalyptus* destroys germs, and is an irritant when applied locally. It quickens the pulse and respiration and lowers the blood pressure. In large doses it causes diarrhœa. *Prunus Virginiana* has a sedative influence over the pneumogastric nerve, from the hydrocyanic acid which is developed in it, and thus quiets cough. *Absinthium* in large doses, or when habitually used in the form of the *liqueur* (*absinthe*), produces epileptiform convulsions.

What are the therapeutic uses of the aromatic bitters?

They are used for the same purposes as the simple bitters.

Serpentaria is used as a *cardiac stimulant* and *tonic* in low fevers, and occasionally as a *stimulating expectorant* in capillary bronchitis and low pneumonias. *Eucalyptus* is used in *chronic catarrhal conditions* of the gastric, broncho-pulmonary, and genito-urinary, mucous membranes, and from its *destructive influence on germs* it is of benefit in vomiting due to sarcina ventriculi. As an *antimalarial* agent it is far inferior to cinchona, but sometimes proves useful where the latter has failed. As a *local* application, it is employed in stomatitis. *Prunus Virginiana* is also used as a *stomachic tonic*, but is especially employed as a *cough-relieving agent* in bronchial catarrh and in phthisis.

What are the preparations and doses of these substances?

1. Extractum Serpentariæ Fluidum (*fluid extract of serpentaria*), dose fʒss–j (2.0–4.0).

Tinctura Serpentariæ (*tincture of serpentaria*), dose fʒj–ij (3.0–7.0).

2. Extractum Eucalypti Fluidum (*fluid extract of eucalyptus*), dose fʒss–j (2.0–4.0).

Oleum Eucalypti (*oil of eucalyptus*), dose ♏v–xv (0.3–1.0) (in capsules or in emulsion).

Eucalyptol, a neutral body obtained from the volatile oil of Eucalyptus globulus and of some other species of Eucalyptus, dose ♏v–xv (0.3–1.0).

3. Extractum Pruni Virginianæ Fluidum (*fluid extract of prunus virginiana*), dose fʒj–ij (3.0–7.0).

Infusum Pruni Virginianæ (*infusion of prunus virginiana*), dose f℥ss–ij (15.0–60.0).

Syrupus Pruni Virginianæ (*syrup of prunus virginiana*), dose fʒj–f℥ss (3.5–15.0).

4 and 5. There are no official preparations of *anthemis and matricaria*, the latter of which is not much used in this country. They are usually given in infusion (chamomile tea) in doses of f℥ij (60.0) t. i. d., as a stomachic tonic.

6. Extractum Eupatorii Fluidum (*fluid extract of eupatorium*), dose fʒss–j (2.0–4.0).

7 and 8. *Cascarilla* and *absinthium* may be given in infusion. There are no official preparations.

At what time should the aromatic bitters be administered?

They should be given shortly before meals when intended to promote appetite and digestion, but when given for their effects on the bronchial or vesical mucous membranes, or for their action on the heart, they should be given between meals.

Peculiar Bitters.

What are the peculiar bitters?

They are such bitters as, owing to peculiarity of action, cannot be classed with either of the preceding groups.

Name the peculiar bitters.

Cinchona and hydrastis.

CINCHONA.

What is cinchona?

Cinchona is the *barks* of all species of Cinchona (*Nat. Ord.* Rubiaceæ) which contain not less than 5 per cent. of total alkaloids, and at least 2.5 per cent. of quinine.

What is the habitat and what are the principal varieties of cinchona?

The cinchona trees are natives of the mountainous regions of the western parts of S. America, from 22° south latitude to 10° north latitude, but have been successfully cultivated in India, Ceylon, Java, the West Indies and other parts of the world. The two principal varieties are *cinchona calisaya* from which is derived the *cinchona flava* (yellow or calisaya bark) and the *cinchona succirubra*, whence comes the *cinchona rubra* (red bark). Other varieties are *C. micrantha* and *C. condaminea*, from which is obtained *cinchona pallida* or pale bark, no longer official.

How is the bark obtained?

The bark was formerly obtained by stripping the trees, but as this killed them and threatened to extinguish the genus, the present method has been adopted. One-fifth the circumference of the tree is denuded of bark in longitudinal strips each year, in the dry season, for five years, at the end of which time the bark has again grown over the portion first denuded. The process is then repeated.

What are the chemical constituents of cinchona?

The most important constituents are the alkaloids *quinine* and *cinchonine*, of which the former is found to preponderate in the yellow bark, the latter in pale barks, and both exist in about equal proportions in red bark. Other important alkaloids are *quinidine* and *cinchonidine*. Combined with these alkaloids are *kinic*, *kinovic*, *cinchotannic* and *kinovo-tannic acids.* Other less important alkaloids are also found, as *aricine*, *paricine*, *quinamine* and *paytine*. *Quinicine* and *cinchonicine* are amorphous modifications of quinine and cinchonine.

Describe a chemical test for the cinchona alkaloids.

If *quinine and quinidine, or their salts*, are treated with fresh chlorine-water, an emerald-green precipitate will form when ammonia-water is added. When the same test is applied to *cinchonine, cinchonidine, or their salts*, a white precipitate results.

What are the physiological effects of cinchona and its alkaloids?

Locally cinchona and its alkaloids are irritant and antiseptic, destroying minute organisms or inhibiting their movements.

Internally it acts on the *alimentary canal* as a simple bitter, in small doses increasing the appetite and digestion; if long continued, producing indigestion and gastric catarrh. In ordinary doses cinchona constipates. In large doses cinchona or its alkaloids irritate the mucous membrane and cause vomiting and diarrhœa.

Nutrition is stimulated and the excretion of waste products increased by small doses; large doses, however, diminish the amount of urea and uric and phosphoric acids in the urine. In malarial fever the products of waste tissue are much increased.

In the *blood* it interferes with the oxygen-carrying function of the red corpuscles, and diminishes the number, inhibits the movements, and prevents the migration of the white corpuscles, both in health and disease.

Circulation: in small doses the cardiac action is increased; large doses, by acting on the cardiac motor ganglia, depress the heart, sometimes causing it to intermit, and finally arrest it in diastole; the blood pressure is lowered.

The *temperature* in health is very slightly, if at all, influenced; in fevers a rapid decline takes place, due to the action on the blood and circulation.

Nervous system; small doses stimulate the cerebral functions; large doses cause *cinchonism* (*i. e.*, a constricted feeling in the forehead; giddiness and tinnitus aurium, with impairment of hearing and sometimes of vision); after toxic doses these symptoms are aggravated and delirium, weak pulse, coma (sometimes convulsions), and in rare cases death, supervene. It probably reduces the reflex excitability of the spinal cord, and although it never causes, may energize uterine contractions when present. *Elimination* takes place chiefly by the urine, the greater portion escaping from the system within eight hours.

Cutaneous eruptions, as erythema, urticaria or herpes are produced in some subjects by even small doses of cinchona or its alkaloids.

What are the therapeutic uses of cinchona and its alkaloids?

1. *As a tonic.* The cinchona preparations, as well as the salts of its alkaloids, are largely used to improve the appetite and digestion in *debility*, the *latter stages of inflammations* and in *convalescence* from acute diseases generally, also in *atonic dyspepsia* (combined with a mineral acid), in *relaxed conditions* of the alimentary mucous membrane and in *summer complaint* of children. The alkaloids are also used as tonics to sustain the vital forces in *diphtheria*, *erysipelas*, *pyœmia*, *septicœmia* in all *typhoid conditions*, in the *eruptive fevers*, and in *surgical shock.* In the various *neuralgiœ* combined with other remedies (as morphine or belladonna, iron or arsenic), it is a valuable agent. From its influence on the migration of leucocytes and on cell proliferation it is used (in larger doses) in the *early stages of inflammation.*

2. *As an antipyretic* in all conditions of hyperpyrexia quinine may be used in large doses, repeated in about six or eight hours to maintain its effects, but the newer and more powerful antipyretics have largely superseded this practice.

3. *As an antiperiodic*, cinchona has no rival in the materia medica. The salts of the alkaloids are preferred for this purpose. Quinine may be used as a *prophylactic* against malaria in small doses, given early in the morning (gr. iij–x, 0.2–0.65). In the treatment of *intermittent* (gr. x (0.65) during the sweating stage, repeated five hours before the next paroxysm is expected), *remittent* (gr. xxx (2.0) per day in two doses, given at any time), *hemorrhagic* and *pernicious malarial fevers* (gr. xx–ʒj (1.3–4.0) administered promptly by the mouth or rectum or even subcutaneously), it acts as a specific. It is useful also in malarial cachexia, but must often be combined or alternated with arsenic and other treatment.

4. *Locally*, quinine may be applied in solution as an astringent and antiseptic to the nares in *summer catarrh*, etc., or to the mouth in *muguet*.

What are the preparations and doses of cinchona and its alkaloids?

Extractum Cinchonæ (*extract of* (yellow bark of) *cinchona*), dose as a *tonic* gr. x–xxx (0.65–2.0).

Extractum Cinchonæ Fluidum (*fluid extract of* (yellow bark of) *cinchona*), dose as a tonic fʒj (4.0).

Tinctura Cinchonæ (*tincture of* (yellow bark of) *cinchona*), dose fʒj–iv (4.0–15.0).

Tinctura Cinchonæ Composita (*compound tincture* (Huxham's) *of cinchona*), containing red bark, serpentaria, bitter orange peel, glycerin, alcohol, and water, dose fʒj–iv (4.0–15.0).

Infusum Cinchonæ (*infusion of cinchona*), containing aromatic sulphuric acid, dose f℥ss–ij (15.0–60.0).

Quininæ Sulphas (*quinine sulphate*), the basic sulphate, not very soluble in water, but rendered more soluble by the addition of diluted sulphuric acid, dose as a *tonic*, gr. j–vj (0.065–0.4); as an *antipyretic*, gr. x–xx (0.65–1.3), repeated as indicated; as an *antiperiodic*, gr. xvj–xx (1.0–1.3) or more.

Quininæ Bisulphas (*quinine bisulphate*), the normal sulphate, more soluble, but containing less quinine than the basic sulphate, and given in slightly larger doses.

Quininæ Hydrobromas (*quinine hydrobromate*), better adapted for hypodermic injection than the sulphates; dose, by the mouth, the same as of quinine sulphate, a little less when used hypodermically.

Quininæ Hydrochloras (*quinine hydrochlorate*), also adapted for subcutaneous use; dose, as of the preceding preparations.

Quininæ Valerianas (*quinine valerianate*), dose gr. j–vj (0.065–0.389).

Quinidinæ Sulphas (*quinidine sulphate*), dose slightly larger than those of quinine.

Cinchoninæ Sulphas (*cinchonine sulphate*), dose ⅓ larger than those of quinine.

Cinchonidinæ Sulphas (*cinchonidine sulphate*), dose gr. j–xv (0.065–1.0) according to the effects desired.

What medicines are incompatible with cinchona?

The *alkalies* and *alkaline earths* precipitate the alkaloids of cinchona; *tannic*, *gallic* and *tartaric acid*, the *tincture* and the *compound solution of iodine* form insoluble compounds with them; and the *ferric salts* precipitate cincho-tannic acid from the preparations of cinchona.

How are cinchona and its alkaloids administered?

The preparations of *cinchona* are frequently combined with the mineral acids or administered alone as tonics; the alkaloids are given in solution, freshly made pills or capsules, or may be made into suppositories, or used subcutaneously. They are often combined with iron, arsenic and other medicines. Saccharin is said to disguise their unpleasant taste.

HYDRASTIS.

What is hydrastis?

HYDRASTIS is the *rhizome* and *roots* of H. canadensis, yellow root or golden seal (*Nat. Ord.* Ranunculaceæ), an indigenous plant.

What alkaloids does it contain?

It contains *hydrastine* (not hydrastin, which is an eclectic preparation) and *berberine.*

What are its physiological actions?

It acts on the appetite, digestion, nutrition and secretions like the simple bitters; it increases the secretions, especially of the glandular appendages of the intestine and probably that of the liver; when given to animals in sufficient doses, it is said to act on the nervous system like strychnine, but less powerfully, stimulating the reflex centres of the spinal cord, heightening the irritability of the motor nerves and causing incoördination, tremor, convulsions, and, finally, death from tetanic spasm of the respiratory muscles. It is also claimed that it always provokes uterine contractions.

What are the therapeutical applications of hydrastis?

It is used as a tonic, to promote appetite, digestion, and nutrition in *atonic dyspepsia* and *chronic gastric catarrh.* From its effects on secretions, it is used in *catarrhal jaundice*, and in *constipation* from deficient secretion, and as a *diuretic* and *blennorrhetic* in *chronic interstitial nephritis* and *chronic cystitis.* It has also been recommended internally to check *uterine hemorrhage.* As an antiperiodic in *intermittent fever* and *chronic malaria* it is inferior to quinine.

Locally, it has been used as an application to sore mouth, fissured nipples, sores and ulcers generally, and as an injection in gleet and vaginal leucorrhœa.

What are the preparations and doses of hydrastis?

EXTRACTUM HYDRASTIS FLUIDUM (*fluid extract of hydrastis*), dose ♏v–fʒj (0.3–4.0); as a stomachic tonic, ♏v–xv (0.3–1.0) before meals.

TINCTURA HYDRASTIS (*tincture of hydrastis*), dose ♏x–fʒj (0.6–4.0).

GLYCERITUM HYDRASTIS (*glycerite of hydrastis*) is chiefly used as a local application.

HYDRASTININÆ HYDROCHLORAS (*hydrastinine hydrochlorate*) has been used to check *uterine hemorrhage*, and also as a *heart tonic* (*vid. oxytocics*); dose gr. ¼–1 (0.016–0.06).

MINERAL TONICS.

Name the mineral tonics.

The MINERAL TONICS are the *preparations of iron* and of *manganese* (which are sometimes classed separately as *hæmatinics* or blood medicines), *phosphorus*, *zinc phosphide*, the *mineral acids*, and *lactic acid*, although of animal origin, is usually considered in connection with the latter.

FERRUM—IRON.

What is the source of iron?

Iron is the most common of all the metals, and is found widely distributed both in the metallic state and as oxide, sulphide, carbonate, phosphate, etc.

What are the physiological effects of iron?

Metallic iron is inert, but when swallowed it is dissolved by the acid of the stomach, and forms salts. It probably enters the blood as an albuminate. Any iron which is not absorbed passing into the intestines, is converted into a sulphide, and colors the stools black. Iron exists normally in the red corpuscles of the blood in the proportion of 1 part of iron to 230 parts of corpuscles. When deficient in the blood, under a course of iron the number of corpuscles increase, the blood is improved in quality, and consequently the tissues are better nourished and all the functions of the body are better performed. In appropriate cases it promotes the appetite and digestion by stimulating the gastric glands, but if given for too long a time it disorders digestion.

The *more soluble preparations* of iron, if given in large doses, cause nausea and vomiting; its *salts*, *with the mineral acids* and *with iodine*, possess more or less toxic properties.

The *sulphates*, *nitrates* and *chlorides* of iron are astringent, diminishing the secretions of the mucous membranes, thus causing constipation, and coagulating albumen, thus proving hæmostatic. Iron is eliminated by the fæces, bile and urine.

What are the therapeutic uses of iron?

1. *As a general tonic* to improve the appetite and digestion, when it should be combined with a purgative, as aloes.

2. *To improve the condition of the blood* and aid nutrition, in *anæmia* and *chlorosis;* in *malarial anæmia* (with quinine); in *various cachexiæ*, as the scrofulous, strumous or syphilitic (iodides); in *amenorrhœa*, *dysmenorrhœa* or *menorrhagia* associated with anæmia; in *fatty degeneration* and in *dilatation of the heart;* in many forms of *neuralgia*, and in many *nervous affections* associated with anæmia, as *epilepsy* or *chorea;* in *convalescence* from acute diseases, and after *exhausting hemorrhages*. In *erysipelas* iron is almost a specific (tincture of the chloride ♏xx–xxx (1.2–2.0) every 2 or 3 hours), and in diphtheria it is also useful.

3. *As an astringent* it is sometimes used internally in *chronic diarrhœa* and in dysentery. In *chronic albuminuria* it is useful both as a tonic and astringent.

4. *As a hæmostatic*, in all *passive hemorrhages* in the anæmic (tincture of the chloride), and in hemorrhages from the lungs, stomach, bowels or kidneys (subsulphate, tersulphate or nitrate in drop doses largely diluted and frequently repeated).

5. *Locally* it is employed as a *styptic* (subsulphate), to check the *bleeding from hemorrhoids* and *leech bites*, or to arrest *capillary oozing* from a large surface; in the form of spray in *epistaxis*, and

hæmoptysis, and it is sometimes injected into the cavity of the uterus (more or less dangerous) to check bleeding from that organ. As an *astringent*, it is applied to syphilitic vegetations (Monsel's solution) and as an injection (largely diluted) in gonorrhœa and leucorrhœa.

What are the preparations of iron and their doses?

FERRUM REDUCTUM (*reduced iron—Quevenne's iron*), an impalpable powder of metallic iron, well borne by the stomach, and not astringent; dose gr. j–v (0.065–0.324).

FERRI OXIDUM HYDRATUM (*hydrated ferric oxide*) and FERRI OXIDUM HYDRATUM CUM MAGNESIA (*hydrated ferric oxide with magnesia*), used almost exclusively as antidotes in arsenical poisoning; dose f℥ss (16.0), every 5 or 10 minutes.

TROCHISCI FERRI (*troches of iron*), each lozenge contains of ferric hydrate nearly gr. v (0.30).

EMPLASTRUM FERRI (*plaster of iron*) contains ferric hydrate, lead plaster, Burgundy pitch, and olive oil.

FERRI CARBONAS SACCHARATUS (*saccharated ferrous carbonate*), dose gr. ij–x (0.130–0.650).

MASSA FERRI CARBONATIS (*mass of ferrous carbonate— Vallet's mass*), dose gr. iij–v (0.20–0.30).

PILULÆ FERRI CARBONATIS (*pills of iron carbonate—Blaud's pills*). Each pill is intended to contain about gr. j (0.0648) of ferrous carbonate, an excellent preparation in anæmia and chlorosis; dose 2–5 pills.

MISTURA FERRI COMPOSITÆ (*compound iron mixture—Griffith's anti-hectic mixture*), dose, in anæmia or chlorosis, f℥ss–ij (15.0–60.0).

FERRI SULPHAS (*ferrous sulphate—green vitriol* or *copperas*). One of the most active and astringent preparations of iron. It is irritant to the stomach, and in overdoses a poison. It is used locally as a styptic and astringent, and in solution to disinfect privies and drains; dose (in pill) gr. ss–ij (0.03–0.13).

FERRI SULPHAS EXSICCATUS (*dried ferrous sulphate*), ferrous sulphate deprived of its water of crystallization; dose gr. ¼–2 (0.016–0.13).

FERRI SULPHAS GRANULATUS (*granulated ferrous sulphate*), dose gr. j–v (0.065–0.30).

8. ABSINTHIUM, the *leaves* and *tops* of Artemisia Absinthium or wormwood (*Nat. Ord.* Compositæ), a European plant.

What are the chief chemical constituents of the aromatic bitters?

They all contain a *volatile oil*, a *bitter principle*, *resin* and *tannic acid.*

The *volatile oil of eucalyptus* is composed of two terpenes, cymol and eucalyptol; that of *Prunus Virginiana* contains hydrocyanic acid, which is formed by the reaction in water of a peculiar ferment (not emulsin) existing in the bark, with the bitter principle; that of *absinthium* contains absinthol.

The *bitter principle of serpentaria* is called *aristolochin;* that of *anthemis*, *anthemic acid;* that of *eupatorium*, *eupaturin;* that of *cascarilla*, *cascarillin;* and that of *absinthium*, *absinthin.*

What are the physiological actions of the aromatic bitters?

Owing to the bitter principles which they contain, their action on digestion, nutrition and secretion is similar to that produced by the simple bitters. They have, in addition, a stimulating influence on the mucous membranes, due to the volatile oils (which are eliminated by the bronchial mucous membrane, skin and kidneys, and increasing their secretions are, somewhat, expectorants, diaphoretics and diuretics), and an astringent effect, owing to their tannic acid. In large doses they are emetic and laxative. *The oil of eucalyptus* destroys germs, and is an irritant when applied locally. It quickens the pulse and respiration and lowers the blood pressure. In large doses it causes diarrhœa. *Prunus Virginiana* has a sedative influence over the pneumogastric nerve, from the hydrocyanic acid which is developed in it, and thus quiets cough. *Absinthium* in large doses, or when habitually used in the form of the *liqueur* (*absinthe*), produces epileptiform convulsions.

What are the therapeutic uses of the aromatic bitters?

They are used for the same purposes as the simple bitters.

Serpentaria is used as a *cardiac stimulant* and *tonic* in low fevers, and occasionally as a *stimulating expectorant* in capillary bronchitis and low pneumonias. *Eucalyptus* is used in *chronic catarrhal conditions* of the gastric, broncho-pulmonary, and genito-urinary, mucous membranes, and from its *destructive influence on germs* it is of benefit in vomiting due to sarcina ventriculi. As an *antimalarial* agent it is far inferior to cinchona, but sometimes proves useful where the latter has failed. As a *local* application, it is employed in stomatitis. *Prunus Virginiana* is also used as a *stomachic tonic*, but is especially employed as a *cough-relieving agent* in bronchial catarrh and in phthisis.

What are the preparations and doses of these substances?

1. EXTRACTUM SERPENTARIÆ FLUIDUM (*fluid extract of serpentaria*), dose f℥ss–j (2.0–4.0).

TINCTURA SERPENTARIÆ (*tincture of serpentaria*), dose f℥j–ij (3.0–7.0).

2. EXTRACTUM EUCALYPTI FLUIDUM (*fluid extract of eucalyptus*), dose f℥ss–j (2.0–4.0).

OLEUM EUCALYPTI (*oil of eucalyptus*), dose ♏v–xv (0.3–1.0) (in capsules or in emulsion).

EUCALYPTOL, a neutral body obtained from the volatile oil of Eucalyptus globulus and of some other species of Eucalyptus, dose ♏v–xv (0.3–1.0).

3. EXTRACTUM PRUNI VIRGINIANÆ FLUIDUM (*fluid extract of prunus virginiana*), dose f℥j–ij (3.0–7.0).

INFUSUM PRUNI VIRGINIANÆ (*infusion of prunus virginiana*), dose f℥ss–ij (15.0–60.0).

SYRUPUS PRUNI VIRGINIANÆ (*syrup of prunus virginiana*), dose f℥j–f℥ss (3.5–15.0).

4 and 5. There are no official preparations of *anthemis and matricaria*, the latter of which is not much used in this country. They are usually given in infusion (chamomile tea) in doses of f℥ij (60.0) t. i. d., as a stomachic tonic.

6. EXTRACTUM EUPATORII FLUIDUM (*fluid extract of eupatorium*), dose f℥ss–j (2.0–4.0).

7 and 8. *Cascarilla* and *absinthium* may be given in infusion. There are no official preparations.

At what time should the aromatic bitters be administered?

They should be given shortly before meals when intended to promote appetite and digestion, but when given for their effects on the bronchial or vesical mucous membranes, or for their action on the heart, they should be given between meals.

gallic acids, hence they cannot be prescribed with any of the vegetable tonics except the simple bitters.

When and how should iron be administered?

The fluid preparations should all be given freely diluted. The solid preparations may be given combined with other remedies in pilular form or in solution. Iron causes less gastric irritation and enters the blood more readily if given with or immediately after meals. If gastric irritability is present in anæmia, a course of bitters with the acids had better precede the administration of iron, which, as these symptoms subside, may be given in the form of the lactate, followed by the bitter wine, and finally by the dried sulphate with arsenic in pill, or by the tincture of the chloride. In anæmia iron should be given in rapidly increasing doses until headache, flushing of the face, and some nausea supervene, when the dose should be diminished or the medicine withheld for a few days. It is important to overcome the resulting constipation by occasional laxatives.

MANGANUM—MANGANESE.

What are the sources of manganese?

Manganese is obtained from the native (impure) dioxide, and also from the carbonate.

What are its physiological actions?

Manganese exists normally in the blood, hair, bile, etc., associated with iron; the proportion to iron in the red corpuscles being as 1 to 20. Given internally in small doses, it improves the appetite, digestion and nutrition; in larger doses, it depresses the heart's action and lowers the blood pressure; if large doses are given for some time, the effects resemble those of zinc (wasting and feebleness, staggering gait, and finally paraplegia). In toxic doses it is a gastro-intestinal irritant. The *sulphate* is an emeto-cathartic and cholagogue. *Potassium permanganate* is a powerful oxidizing agent, and hence an antiseptic. It increases the menstrual flow.

For what medicinal purposes is manganese used?

It has been used (1) *to improve the condition of the blood* in *anæmia* and *chlorosis* and in *various cachexia*, either combined with iron or as a substitute for it; (2) *to improve the appetite and digestion* in *gastrodynia* and *pyrosis;* (3) *as a cholagogue* in *jaundice* when of malarial origin (sulphate); (4) *as an antidote to snake bites* and other animal poisons, and in poisoning by morphine (potassium permanganate internally and locally); (5) in *amenorrhœa* (potassium permanganate); and (6) *locally* as a *disinfectant* and to *correct fetor* in *scarlatina* and *diphtheria* (permanganate as a gargle), or applied to *cancerous or other ulcers*, *abscesses*, *otorrhœa*, etc.

What are the preparations and doses of manganese?

MANGANI DIOXIDUM (*manganese dioxide*), dose gr. j–x (0.065–0.65), in pill, powder, or capsule.

MANGANI SULPHAS (*manganese sulphate*), dose gr. j–v (0.065–0.32).

POTASSII PERMANGANAS (*potassium permanganate*), dose gr. ss-ij (0.032–0.13) in distilled water, in capsule, or made into pill with kaolin.

What medicines are incompatible with manganese?

The salts of lead, silver, and mercury, and the caustic alkalies are chemically incompatible with the manganese preparations.

PHOSPHORUS.

What is the source from which phosphorus is obtained?

Phosphorus is obtained from the calcium phosphate of bones.

What are the physiological effects of phosphorus?

Phosphorus exists normally in nervous tissue and in the bones. *Locally* applied, phosphorus causes inflammation, ulceration, and even gangrene of the skin. *The vapor*, when inhaled, irritates the mucous membrane, and if caries of the teeth exist, may cause caries or necrosis of the maxillæ.

In medicinal doses, phosphorus increases the *appetite and digestion* (if too long continued, it disorders digestion), and causes eructations of hydrogen phosphide; increases *nutrition*, the *cardiac action* and cutaneous circulation, *mental activity*, *sexual activity*, the formation of the *compact tissue of bone*, and the excretion of phosphates by the *urine.* It is *eliminated* by the liver, kidneys, mucous membrane and skin.

What are the toxic effects of phosphorus?

From 1 to 3 hours after a poisonous dose has been swallowed, violent *epigastric pains* occur, followed by nausea and *vomiting* (the vomited matter *smelling of phosphorus* and being *luminous in the dark*); *vomiting of blood* occurs at a later period; violent purging takes place if the phosphorus passes into the bowel. *Jaundice* may supervene after several days if the patient lives. The pulse is at first strong, soon becoming feeble and rapid. There is great thirst, restlessness, anxiety, noisy delirium or coma and death, preceded by convulsions. The *urine* is diminished, contains albumen, blood, and (after jaundice occurs), biliary pigment. After death, acute fatty degeneration of various viscera, as the liver, kidneys, heart and the walls of the arterioles and capillaries is found: the red corpuscles are altered in form and the blood contains much fat.

What is the treatment of acute poisoning by phosphorus?

1. Give *cupric sulphate* gr. v (0.32) at once as an emetic and as an antidote (forming a less soluble phosphide).

2. Give *hydrated magnesia* as a purgative.

3. Continue the use of *cupric sulphate* in small doses (gr. $\frac{1}{12}$ (0.005) every fifteen or twenty minutes) as an antidote or emetic, or, better, give *turpentine* (French acid turpentine or old common, crude turpentine, which forms with phosphorus an almost insoluble spermaceti-like mass) as soon as possible, to neutralize the poison.

4. Give *opium* to counteract the general depression.

5. If the blood is much damaged, transfusion should be resorted to.

6. Never, under any circumstances, give any oils (except turpentine) or fats, as they increase the solubility of phosphorus.

What are the medicinal uses of phosphorus?

Phosphorus is used as a *tonic to promote nutrition*: (1) In various nervous affections associated with anæmia, as, *cerebral exhaustion*, *locomotor ataxia*, *paralysis agitans*, and the various *neuralgiæ*; (2) in general diseases, as, *osteomalacia*, *rickets* and *pernicious anæmia*; (3) in *functional impotence*, and (4) as a substitute for arsenic in certain skin diseases, as *lupus* and *psoriasis*.

What are the preparations of phosphorus and their doses?

PILULÆ PHOSPHORI (*pills of phosphorus*); each pill contains gr. $\frac{1}{100}$ (0.006) of phosphorus; dose j–v pills, t. i. d.

SPIRITUS PHOSPHORI (*spirit of phosphorus—tincture of phosphorus*) contains 1.2 gm. of phosphorus to 1000 c.c. of the preparation, and is used in making

ELIXIR PHOSPHORI (*elixir of phosphorus*); each c.c. contains 0.00025 gm. of phosphorus; dose ♏x–fʒj (0.61–4.0).

OLEUM PHOSPHORATUM (*phosphorated oil*) contains phosphorus (1 per cent.) dissolved in ether and almond oil; dose ♏j–v (0.06–0.31).

ZINCI PHOSPHIDUM (*zinc phosphide*) is identical in its actions and uses with phosphorus, but not so active; dose gr. $\frac{1}{20}$–$\frac{1}{12}$, or even $\frac{1}{2}$ (0.003–0.03) given in pill or granule.

What medicines are incompatible with phosphorus?

Hydrated magnesia, lime-water, cupric sulphate, powdered charcoal and oil of turpentine are chemically incompatible with it.

What substances aid its absorption?

The oils and fats.

What caution should be observed in prescribing it?

Great care should be taken, especially when large doses are prescribed, that the remedy be not administered for a long period continuously, for fear of causing fatty degenerations of the visceræ.

MINERAL ACIDS.

What are the general effects of the acids and alkalies upon secretions?

LAW I. *Acids* increase *alkaline* secretions.
LAW II. *Acids* decrease *acid* secretions.
LAW III. *Alkalies* increase *acid* secretions.
LAW IV. *Alkalies* decrease *alkaline* secretions.

How may these laws be applied to the treatment of digestive disturbances?

1. *To decrease excessive acidity of the gastric juice—*
    (*a*) Give an acid before meals to diminish its secretion, or
    (*b*) An alkali after meals to neutralize the acid present.
2. *To increase the acidity of the gastric juice when it is deficient in that quality—*

(*a*) Give an alkali before meals to increase the secretion of acid, or

(*b*) An acid after meals to supply the deficiency.

Name the mineral acids.

The mineral acids are *sulphuric*, *nitric*, *hydrochloric*, *nitro-hydrochloric* and *phosphoric*.

What are their physiological effects?

Locally the strong acids are *escharotics*, abstracting water from the tissues and combining with the bases. *Sulphuric* and *phosphoric* acids penetrate the tissues more deeply than the others. *Sulphuric* produces a *black*, while *nitric* acid causes a *yellow* eschar.

Internally, in a diluted state and in medicinal doses, they increase the *appetite*, *digestion* and *nutrition* (hydrochloric and phosphoric being more pronounced in their effects). If taken for some time continuously, they diminish the acid of the gastric juice and disorder digestion (sulphuric acid more quickly than the others). Sulphuric acid possesses an astringent influence over the secretions of the skin and bowels; nitric acid, on the contrary, appears to increase the alimentary secretions and that of the liver.

They are *eliminated* by the secretions of the kidneys, bowels and skin. *In large doses* they act as irritant corrosive poisons.

How should poisoning by the mineral acids be treated?

1. Give *alkalies* or *alkaline earths* (tooth powder or soap may be used) to neutralize the acid.
2. Give *eggs*, *milk*, or other *demulcents* to protect the surface.
3. Give *opium* and *nutritive* and *stimulating enemata*, or *intravenous injection* of ammonia, to counteract the resulting depression.
4. As stricture of the œsophagus often follows in these cases if they survive, the passage of an œsophageal bougie should be practiced within 3 or 4 months after the poisoning.

What are the therapeutic uses of the mineral acids?

1. *For their effects on digestion and nutrition.* To prevent excessive formation of acid (both where too much is secreted and where it is formed by fermentation of the food), diluted hydrochloric or phosphoric acid is given before meals; or in *atonic dyspepsia* and *indigestion* due to deficient acid, they may be taken after meals (often

combined with pepsin). *In fevers*, they are used to aid digestion and secretions generally and allay thirst (by stimulating the secretions of the mouth and fauces, thus keeping these parts moist).

2. *For their effects on secretion.* Diluted nitric or nitro-hydrochloric acid is used internally to increase the secretions, and as a bath (f℥iij to water Cj), in *chronic hepatic congestions* and *inflammations*, in *malarial* and *catarrhal jaundice* and in *duodenal catarrh.* As an *astringent in diarrhœas*, *dysentery* and *cholera* diluted sulphuric acid is given combined with opium; and to arrest profuse sweating diluted or aromatic sulphuric acid may be temporarily employed.

3. *As a hæmostatic* the same agent is often used in uterine or intestinal hemorrhage and occasionally in purpura.

4. *In the treatment of, or as a preventive to, lead poisoning* diluted sulphuric acid is administered (forming an insoluble lead sulphate).

5. *Locally, as an escharotic*, fuming nitric acid may be applied to *chancroids*, *phagedenic ulcers*, *hospital gangrene* or *gangrene in wounds.* It is also used to remove *warts*, and as an intra-uterine application in various forms of *endometritis.* As a *stimulating lotion* to *unhealthy granulations*, and to check bleeding from hemorrhoids, weak solutions of nitric acid are used.

What are the preparations of the mineral acids, and what are their doses?

1. Acidum Sulphuricum (*sulphuric acid—oil of vitriol*) contains not less than 92.5 per cent. of *absolute* sulphuric acid, and is too strong for internal use.

Acidum Sulphuricum Dilutum (*diluted sulphuric acid*) contains 10 per cent., by weight, of the *official sulphuric acid*, and is used internally as a *tonic*, *refrigerant*, *astringent*, and *hæmostatic;* dose ♏ij–xx (0.123–1.23) freely diluted.

Acidum Sulphuricum Aromaticum (*aromatic sulphuric acid—elixir of vitriol*) contains 10 per cent. of the *official acid* with alcohol, tincture of ginger, and oil of cinnamon. It is used as a pleasant substitute for the preceding preparation and is given in the same doses.

2. Acidum Nitricum (*nitric acid*) contains 68 per cent. of the *absolute* acid, and is not employed internally.

Acidum Nitricum Dilutum (*diluted nitric acid*) contains 10 per cent., by weight, of *absolute* nitric acid; dose ♏ij–xx (0.123–1.23) freely diluted.

3. ACIDUM HYDROCHLORICUM (*hydrochloric acid—muriatic acid*) contains nearly 32 per cent., by weight, of *absolute* acid, and is not used internally.

ACIDUM HYDROCHLORICUM DILUTUM (*diluted hydrochloric acid—diluted muriatic acid*) contains 10 per cent. of the absolute acid. It is (probably) a normal constituent of the gastric juice, and is used as an aid to digestion; dose ♏v–xx (0.31–1.23) freely diluted.

4. ACIDUM NITROHYDROCHLORICUM (*nitrohydrochloric acid—nitromuriatic acid—aqua regia*) is used as a stomachic tonic and to increase the secretions of the liver and intestines; dose ♏ij–x (0.123–1.23) freely diluted.

ACIDUM NITROHYDROCHLORICUM DILUTUM (*diluted nitrohydrochloric acid—diluted nitromuriatic acid*); dose ♏ij–xx (0.123–1.23) freely diluted.

5. ACIDUM PHOSPHORICUM (*phosphoric acid*) contains 85 per cent., by weight, of absolute ortho-phosphoric acid, and is not used internally.

ACIDUM PHOSPHORICUM DILUTUM (*diluted phosphoric acid*) contains 10 per cent., by weight, of absolute ortho-phosphoric acid, and is chiefly used as an aid to digestion; dose ♏v–xxx (0.31–1.85) freely diluted.

What medicines are incompatible with the mineral acids?

1. Alkalies and their carbonates and the salts of lime and lead are incompatible with the mineral acids, which also decompose salts of the vegetable acids, uniting with their bases.

2. The mercurial salts should not be given during the administration of hydrochloric or nitro-hydrochloric acids or their preparations, as they may react with the mercury and form corrosive sublimate.

How and when are these acids administered?

They are administered before or after meals, according to the indications present, and may be given freely diluted with water either alone or with glycerin and syrup, or with some of the bitters.

They should be taken through a glass tube to prevent injury to the teeth, or the mouth may be washed out immediately after their use with some weak alkaline solution.

ACIDUM LACTICUM—LACTIC ACID.

What is lactic acid?

Lactic acid is a syrupy liquid, formed by the souring of milk.

What are its effects and uses?

It is a normal ingredient of the gastric juice. In *medicinal doses* it increases the appetite, aids digestion and stimulates nutrition. In *large doses* (f℥j) or *long continued* it disorders digestion, causing flatulency and epigastric pain. *Injected into the peritoneal cavity* (dog's) it produces endocarditis, and when given for a very long time (in diabetes) it has caused acute rheumatism. *Lactic acid is used* to *diminish the acidity* of the gastric juice, or to *replace the deficiency of the acid;* to aid digestion and nutrition in *oxalic, phosphatic* or *uric* acid *diathesis;* in *diabetes*, and *locally* as a solvent for the false membranes of croup and diphtheria. It has been claimed that it is a hypnotic in *insomnia* due to nervous excitement, but this is still *sub judice.*

What are its preparations and doses?

Acidum Lacticum (*lactic acid*) contains 75 per cent. of absolute lactic acid. Dose ♏v–xxx (0.30–1.85) freely diluted and often prescribed in a mixture with pepsin.

ORDER III.—ALTERATIVES.

What are alteratives?

Alteratives are medicines which, without exerting any very perceptible action on any particular organ, so modify the nutritive processes as to enable nature to restore healthy action in many diseased conditions.

Mention the principal alteratives.

The preparations of mercury and of gold; iodine and the iodides: the arsenical preparations; cod-liver oil; the phosphates and hypophosphites; the chlorides of ammonium and calcium; colchicum; sarsaparilla; guaiac; and perhaps mezereon; menispermum; calendula; sassafras, stillingia, dulcamara, and lappa.

HYDRARGYRUM—MERCURY.

What is mercury?

Mercury is a liquid metal principally obtained from the native sulphide or cinnabar.

What are the physiological effects of mercury?

Metallic mercury (quicksilver) is inert either when swallowed or applied to the skin, but if retained in the alimentary canal or after prolonged contact with the skin, it often becomes converted into an oxide and produces constitutional effects. *When inhaled* in a state of vapor it frequently causes salivation, ulceration of the mouth, necrosis and wasting; or in other cases loss of memory, vertigo, shaking palsy and other nervous symptoms.

Minute doses of mercurials, not too frequently repeated, increase the number of red corpuscles in the blood and improve nutrition. In *small and repeated doses* they stimulate the secretions of the skin and mucous membranes, the liver and kidneys and the salivary glands and pancreas, and promote absorption. *Corrosive sublimate* is an hepatic stimulant of considerable power, but the other preparations probably increase the flow of bile by irritating the duodenal mucous membrane, thus causing reflex contractions of the gall bladder. By stimulating the liver, *corrosive sublimate* increases the formation of urea, and thus proves diuretic. It also feebly stimulates the intestinal glands. *In moderate doses* the mercurials are cathartic (especially calomel and blue mass). *In large doses*, or continued for some time, the secretions are much increased and become pathological; the gums are swollen and tender, the mouth sore, the teeth feel elongated, salivation occurs, which becomes profuse if the medicine is continued; the breath is offensive, a metallic taste is experienced; the proportion of albumen, fibrin and red corpuscles to the fluid of the blood is diminished; the body wastes, and, if the abuse of mercury be continued, mercurial fever, diarrhœa, ulceration and sloughing of the gums, loosening of the teeth and sometimes necrosis of the alveolar processes, albuminuria, marasmus and grave nervous symptoms occur. Salivation (ptyalism) is more easily caused by blue mass and calomel, less so by corrosive sublimate and mercury with chalk.

Corrosive sublimate, beside its cholagogue and diuretic properties, retards hyperplasia of connective tissue, is a powerful gastro-intestinal irritant, and locally the best antiseptic, proving rapidly destructive to germs.

What are the symptoms and treatment of poisoning by corrosive sublimate?

The symptoms are violent gastro-enteritis with vomiting and purging, bloody stools, abdominal pain and tenderness, albuminous urine and death from collapse. The treatment consists in (1)giving an antidote, *albumen* is the best (*white of eggs*, milk or wheat flour); (2) giving an emetic; and (3) the free use of opiates and demulcents.

What are the therapeutic uses of mercury?

Mercury is used (1) as an *antisyphilitic*, either by the mouth (yellow iodide, calomel, blue mass, corrosive sublimate), fumigation (calomel), inunction (mercurial ointment or oleate), or hypodermic injection (albuminate, peptonate, or even calomel or corrosive sublimate). It is of most use in secondary syphilis, the iodides (alone or combined with the red iodide or corrosive chloride) giving better results in tertiary syphilis.

(2) As an *antiplastic and sorbefacient* in *acute glandular affections*, *iritis* and the *latter stages of inflammations* after plastic effusion has occurred. In *diphtheria* and *membranous croup* calomel is advantageously given in repeated doses guarded by minute doses of opium. In the latter disease the subsulphate is often used as an emetic. Mercurials are useful in ileo-colitis of infants (gray powder) and in acute dysentery (corrosive sublimate). (3) As an *indirect tonic* and to *stimulate secretions*, calomel, gray powder or blue mass are used in dyspepsia attended with constipation and torpid liver, and in the early stages of acute diseases. (4) As a *purgative* calomel and blue mass are often used, frequently followed by some saline. (5) *Locally* as *antiseptics* mercuric chloride or iodide are almost indispensable in surgical practice. Various preparations are used locally in various *skin diseases*, especially of parasitic origin, to *promote absorption* in *goitre*, *enlarged spleen*, *chronic epididymitis* and *orchitis* and other glandular swellings. The ointments are also used in conjunctivitis.

What are the preparations of mercury and their doses?

Massa Hydrargyri (*mass of mercury—blue mass*), dose as a *laxative*, gr. v–xv (0.33–1.0); as an *alterative*, *antisyphilitic*, or *sorbefacient*, gr. ss–iij (0.03–0.2), t. i. d., guarded by opium, and often combined in the treatment of syphilis with iron or quinine.

Unguentum Hydrargyri (*mercurial ointment—blue ointment*). Not used internally. Used externally for *inunction* in syphilis; as a *sorbefacient*, to *destroy pediculi;* and as a dressing to *syphilitic ulcers.*

Emplastrum Hydrargyri (*mercurial plaster*), used locally as a *sorbefacient.*

Emplastrum Ammoniaci cum Hydrargyrô (*plaster of ammoniac with mercury*), is more stimulating than the former.

Hydrargyrum cum Cretâ (*mercury with chalk—gray powder*), contains mercury, 38 parts, with prepared chalk and sugar of milk, and is used as an *alterative* and *antisyphilitic;* dose for an adult gr. j–v (0.06–0.32), for a child gr. $\frac{1}{4}$ (0.02) t. i. d.; as a mild laxative gr. v–xv (0.33–1.0) (for a child gr. iij–v (0.2–0.33)). It should not be prescribed in pill form.

Hydrargyri Oxidum Rubrum (*red mercuric oxide*) and

Hydrargyri Oxidum Flavum (*yellow mercuric oxide*) are rarely used except in the form of

Unguentum Hydrargyri Oxidi Rubri (*ointment of red mercuric oxide—red precipitate ointment*) and

Unguentum Hydrargyri Oxidi Flavi (*ointment of yellow mercuric oxide*), each containing 10 per cent. of mercuric oxide, and which are applied in *granular* and other forms of *conjunctivitis* and in *corneal ulcers.*

Oleatum Hydrargyri (*mercurial oleate*), contains 10 per cent. of the yellow oxide dissolved in oleic acid. Used chiefly for inunction in syphilis.

Hydrargyri Chloridum Mite (*mercurous chloride—calomel*), dose, as a *purgative* or *anthelmintic*, gr. ss–j–x (0.03–0.06–0.6) at bedtime; as an *antisyphilitic* gr. $\frac{1}{10}$–j (0.006–0.06), t. i. d., with opium; as an *alterative* and *absorbent* gr. ss–j (0.03–0.06) every 2 or 3 hours; for its effect on *secretions* gr. ss–j (0.03–0.06) t. i. d.; to *arrest vomiting* gr. $\frac{1}{10}$–j (0.006–0.06) combined with sodium bicarbonate and frequently repeated. It is used externally as a dusting powder to the conjunctiva, and as an ointment in various skin affections. It is also used by *fumigation* in syphilis.

Hydrargyri Chloridum Corrosivum (*mercuric chloride—cor-*

rosive sublimate), used as an *alterative* and *antisyphilitic*; dose gr. $\frac{1}{16}$–$\frac{1}{8}$ (0.004–0.008) by the mouth, gr. $\frac{1}{48}$–$\frac{1}{16}$ (0.001–0.004) by hypodermic injection. Locally, in weak solutions as an injection in *gonorrhœa* after the more acute stage has passed (gr. $\frac{1}{12}$–$\frac{1}{8}$–f℥viij (0.005–0.008–236.5)) or as a *tœniacide* in ringworm, etc., or for the destruction of pediculi. As an *antiseptic* gr. vijss to hot water Oij = 1 part to 2000.

Hydrargyri Iodidum Flavum (*mercurous iodide*), dose as an *antisyphilitic* gr. $\frac{1}{8}$–j (0.008–0.065) combined with opium in pill. Used also locally, in the form of ointment, to syphilitic ulcers.

Hydrargyri Iodidum Rubrum (*mercuric iodide*), dose as an *alterative* or *antisyphilitic* gr. $\frac{1}{16}$–$\frac{1}{4}$ (0.004–0.016). It is often combined with potassium iodide in the treatment of tertiary syphilis, and is used locally in the form of ointment to promote the absorption of glandular swellings, goitre, enlarged spleen, etc. As an *antiseptic* it is used in solution of gr. iv–vijss (0.259–0.454) to hot water Oij (950.3). Potassium iodide increases its solubility.

Hydrargyri Cyanidum (*mercuric cyanide*) is used in syphilis as a substitute for corrosive sublimate, dose gr. $\frac{1}{16}$–$\frac{1}{12}$ (0.004–0.005).

Hydrargyrum Ammoniatum (*ammoniated mercury—white precipitate*) is only used externally as

Unguentum Hydrargyri Ammoniati (*ointment of ammoniated mercury*), which contains 10 per cent. of ammoniated mercury, and is used especially in parasitic skin diseases and to destroy pediculi.

Hydrargyri Subsulphas Flavus (*yellow mercurial subsulphate—turpeth mineral*), dose as an alterative gr. $\frac{1}{4}$–ss (0.016–0.032); as an *emetic* in croup, gr. j–v (0.065–0.324), in syrup, repeated every 10 or 15 minutes until free vomiting occurs.

Unguentum Hydrargyri Nitratis (*ointment of mercurial nitrate—citrine ointment*), used externally (usually diluted with other ointment) in various skin affections, especially those of parasitic origin, to destroy pediculi and as a dressing for venereal ulcers.

Liquor Hydrargyri Nitratis (*solution of mercuric nitrate—acid nitrate of mercury*), used as an *escharotic*. Diluted with water, it forms a useful stimulating application to indolent ulcers.

What substances are incompatible with the mercurial preparations?

The *metallic preparations* and *calomel* are incompatible with the chlorides, hydrochloric and nitro-hydrochloric acids, which are apt to form with them corrosive sublimate. *Calomel* is also incompatible with the alkalies, their carbonates, alkaline earths, soap and the hydrosulphates. *Corrosive sublimate* is decomposed by nearly everything, and *green mercurous iodide* is converted into the more active red mercuric iodide by combination with iodine and other iodides.

AURUM—GOLD.

What are the physiological effects of the salts of gold?

Locally they are caustic. *Internally* in *small doses* they increase the appetite, digestion, glandular secretions, and excretions of urine and perspiration; they stimulate the nervous system, and particularly the spinal cord; they stimulate the sexual organs, and in women (probably) increase the menstrual flow. In *larger doses*, or after prolonged use, they disorder digestion, cause salivation without ulceration of the gums, diminish the oxygen-carrying function of the red globules, and stimulate the lymphatic system, thus causing rapid wasting. In *overdoses* they are gastro-intestinal irritants, the *symptoms* and *antidote* being the same as those of poisoning by corrosive sublimate.

What are the medicinal uses of the gold salts?

They are used as substitutes for corrosive sublimate in the treatment of *tertiary syphilis;* as *alteratives* in scrofula, chronic Bright's disease, myelitis, chronic ovarian inflammations and neuralgia; and as *aphrodisiacs* in functional impotence.

The so-called "*bichloride of gold*" or "*Keely cure*" does not consist in the administration of gold bichloride, as no such salt is known. The cures are probably largely effected by suggestion. It frequently fails to effect a cure, and many relapses occur.

What are the preparations and doses of the gold salts?

AURI ET SODII CHLORIDUM (*gold and sodium chloride*) is the only official preparation; dose gr. $\frac{1}{30}$–$\frac{1}{10}$ (0.002–0.006), in pill or capsule.

IODUM—IODINE.

What is iodine?

Iodine is a non-metallic element, obtained from the ashes of seaweed.

What are the physiological effects of iodine and the iodides?

Iodine is a *disinfectant* and *antiseptic*. *Locally* applied, it is an *irritant caustic* to the skin and mucous membranes, staining the former yellow and causing superficial inflammation and desquamation, and sometimes even vesication. The *vapor*, when inhaled, is irritant to the air passages. In sufficient amounts it is a gastro-intestinal irritant. It enters the blood readily, and, combining with sodium or potassium, corresponds, in its constitutional effects, to the *iodides*. They *stimulate* the *lymphatic system* and cause the *absorption* especially of newly-formed tissues and diseased cells, thus removing indolent swellings, inflammatory and syphilitic deposits and various metallic poisons, as lead, mercury, etc., which may have been deposited in the tissues. When *too long administered*, they cause great emaciation and depression of the vital powers. They are rapidly *eliminated* by the mucous membranes (irritating them in their passage), salivary glands and kidneys.

Given in *large quantities*, they cause *iodism*, *i. e.*, malaise, some fever, frontal headache, coryza, lachrymation, sore throat, difficult swallowing, various eruptions on the face and shoulders and ant-aphrodisiac effects, sometimes permanent. The susceptibility varies greatly in different persons, but these symptoms may in great measure be prevented by copious draughts of water frequently taken during the course of treatment.

What is the treatment of acute poisoning by free iodine?

A decoction of starch is the *antidote*, followed by emetics, and opium and demulcents.

What are the therapeutic uses of iodine and the iodides?

They are employed as *alteratives* and *absorbents* in the active manifestations of *tertiary syphilis* (iodides chiefly), in the treatment of *scrofulous and glandular enlargements*, in the early stages of *cirrhosis* of the liver or kidneys, in the various forms of *sclerosis* of the nervous centres, and in *chronic poisoning* by mercury, lead and other metals; to aid the absorption of *lingering pneumonic consolidation* (ammonium iodide) and of *plastic* and *serous* inflammatory *exudations* (potassium iodide), in *aneurisms* (large doses of potassium iodide), in *chronic rheumatism* and in *malaria* (iodine preparations).

For their effects on the *mucous secretions* the iodides are given in *chronic bronchitis, spasmodic asthma, catarrhal pneumonia, acute catarrh, hay fever* and *duodenal catarrh.* It is highly recommended internally in the treatment of *typhoid fever*, and has been used to check the *vomiting of pregnancy. Locally, iodine* is used by inhalation in *catarrh, coryza* and *hay fever*, and is applied to *aid absorption* and as a *counter-irritant* to *chronic inflammations* and *chronic glandular* and other *swellings. The tincture* is *injected* undiluted into the serous cavity after the removal of the fluid in empyema, hydrocele, etc., and is applied to the uterine cavity in various forms of *endometritis.*

What are the preparations and doses of iodine and the iodides?

Liquor Iodi Compositus (*compound solution of iodine—Lugol's solution*), containing iodine (5 parts), potassium iodide (10 parts), and water (85 parts); dose ♏v–xv (0.308–0.924) t. i. d.

Tinctura Iodi (*tincture of iodine*), containing 8 per cent. of iodine; dose ♏ij–xv (0.123–0.924) t. i. d. It is chiefly used externally.

Unguentum Iodi (*iodine ointment*) contains iodine (4 parts), potassium iodide (1 part), water (2 parts), and benzoinated lard (93 parts).

Potassii Iodidum (*potassium iodide*), dose gr. ij–xv–ʒj (0.130–0.972–3.888) t. i. d.

Unguentum Potassii Iodidi (*ointment of potassium iodide*) is much less powerful than iodine ointment.

Ammonii Iodidum (*ammonium iodide*), dose gr. ij–xv (0.132–0.972).

Sodii Iodidum (*sodium iodide*), dose gr. v–xxx (0.324–1.944).

Sulphuris Iodidum (*sulphur iodide*) is but little used; dose gr. ½–j (0.032–0.065).

STRONTII IODIDUM (*strontium iodide*) is supposed to be as efficacious as the other iodides and to be less likely to cause iodism; dose gr. v–x (0.324–0.648).

The *mercurial iodides* and *iron iodide* have already been mentioned. *Arsenic, zinc and lead* iodides will be described in their appropriate places.

What are the incompatibilities of these preparations?

The *iodides* are incompatible with the acids and acidulous salts, with the soluble metallic salts generally; with most of the alkaloids and with sweet spirits of nitre. Iodine is precipitated from the *tincture* on the addition of water.

How are iodine and the iodides administered?

Lugol's solution may be given in syrup and water. The iodides may be administered in compressed pill or capsule, or they may be given dissolved in water flavored with orange syrup, or in one of the bitter tinctures, or in compound syrup of sarsaparilla. Nothing effectually disguises their unpleasant taste.

ARSENUM—ARSENIC.

What is arsenic?

Arsenic is a metallic element, found in various ores combined with other metals as an arsenide.

Mention some of the tests for arsenic.

When *in powder*, if heated with charcoal in a small test tube, it sublimes and condenses in the form of a brilliant steel gray ring of minute octahedral crystals, soluble in sodium or calcium hypochlorite. When in *solution*, the addition of sulphuretted hydrogen or ammonium sulphide produces a lemon-yellow arsenic trisulphide, insoluble in diluted hydrochloric acid, but soluble in a solution of ammonium carbonate: also the addition of ammonia water followed by a solution of silver nitrate, gives a canary-yellow silver arsenite. Marsh's and Reinsch's tests should also be used.

What are the physiological effects of arsenical preparations?

Metallic arsenic is inert, but when swallowed may be converted into arsenous acid and cause poisoning. No matter how administered, it has a selective action on the gastro-intestinal and broncho-pulmonary mucous membranes. *Locally*, arsenous acid is a painful *caustic*, and when in sufficient amount produces so much inflammation that absorption cannot take place. The *inhalation* of arsenical fumes (as from wall papers) have caused poisoning. Given *internally in small doses* it improves the appetite, digestion, nutrition and condition of the blood; stimulates the secretions of the alimentary canal and increases peristalsis; slightly stimulates the respiratory and circulatory centres and the cerebral functions; and lessens the excretion of carbonic acid and urea. *In larger doses* (not toxic), or when *taken for some time continuously*, it irritates the mucous membranes, disorders digestion, gives rise to *epigastric pain*, *nausea* and vomiting, diarrhœa, tenesmus and sometimes dysentery, palpitation, oppressed breathing, *œdema of the eyelids*, albuminuria, cutaneous eruptions, tremor and disordered sensation. It is *eliminated* by the mucous membrane, liver, kidneys and skin. *Tolerance* is sometimes established, and very large doses may be taken without poisonous effect.

What are the symptoms, pathological anatomy and treatment of acute arsenical poisoning?

The symptoms of the gastro-intestinal variety of poisoning are *intense* burning pain in the epigastrium, radiating over the abdomen, violent vomiting, great thirst, bloody and offensive stools, strangury and bloody urine, rapid feeble heart, oppressed breathing and collapse, sometimes simulating cholera. *Those of the cerebral variety* are sudden, profound insensibility and coma with collapse.

Pathological Anatomy.—Alimentary mucous membrane congested, eroded, softened and ecchymotic; *broncho-pulmonary mucous membrane* and lungs congested; fatty degeneration of the *liver*, *kidneys* and other organs.

Treatment, (1) give a *prompt emetic* or use the stomach pump; (2) give as antidotes *hydrated ferric oxide* or the *hydrated ferric oxide with magnesia*, and continue the emetics; (3) mucilaginous drinks to protect the surfaces; (4) large amounts of diluents to favor elimination.

Prognosis.—Death often results long afterward, from the pathological conditions produced by the poison.

What are the medicinal uses of the arsenical preparations?

Arsenic is used as a *tonic* and *alterative* in *anœmia* and *chlorosis*, persistent *malaria*, *rheumatoid arthritis* and *chronic rheumatism*, and to delay the formation of connective tissue in the various *scleroses* and the growth of *carcinomata*. In minute doses it is used as a gastric tonic in *irritative dyspepsia*, *gastric ulcer* and *cancer*, and in *gastralgia* and *enteralgia*. (Fowler's Solution.) In *emphysema*, *chronic bronchitis* and *phthisis* it is of value. For its nervous action it is used in *chorea*, *neuralgiœ*, *paralysis agitans* and *melancholia*. In *chronic skin diseases*, as psoriasis, eczema and acne, it is of the greatest service, and in *diabetes* and *sexual debility* it is highly recommended. *Locally*, arsenous acid has been used as a caustic in *lupus*, *onychia maligna*, *cancer*, and to destroy the nerves of carious teeth. Cigarettes made of bibulous paper saturated with a solution of sodium arsenate are smoked for the relief of *asthma.*

What are the preparations and doses of arsenic?

ACIDUM ARSENOSUM (*arsenous acid—white arsenic*), dose gr. $\frac{1}{16}$–$\frac{1}{12}$ (0.004–0.005) in pills t. i. d.

LIQUOR POTASSII ARSENITIS (*solution of potassium arsenite—Fowler's Solution*) contains arsenous acid gr. $\frac{6}{10}$ in each fʒj of solution; dose ♏j–x (0.061–0.616) freely diluted.

LIQUOR ACIDI ARSENOSI (*solution of arsenous acid*), dose ♏j–x (0.061–0.616) freely diluted.

SODII ARSENAS (*sodium arsenate*) is milder in its action than the foregoing preparations; dose gr. $\frac{1}{12}$–$\frac{1}{4}$ (0.005–0.016).

LIQUOR SODII ARSENATIS (*solution of sodium arsenate*), dose ♏ij–x (0.123–0.616) freely diluted.

ARSENI IODIDUM (*arsenic iodide*), dose gr. $\frac{1}{8}$ (0.008) t. i. d.

LIQUOR ARSENI ET HYDRARGYRI IODIDI (*solution of arsenic and mercuric iodide—Donovan's Solution*) contains 1 per cent. of arsenic iodide and of mercuric iodide each, and is used in obstinate syphilis and in papular and squamous skin diseases; dose ♏ij–x (0.123–0.616) freely diluted.

What medicinal substances are incompatible with these preparations?

The *salts of iron*, *magnesium* and *calcium* and the *astringents* are chemically incompatible with the preparations of arsenic. *Fowler's Solution* should not be prescribed with infusions or decoctions of cinchona nor *Donovan's Solution* with the alkalies, or the salts of the alkaloids.

How and when is arsenic administered?

As individual susceptibility to arsenic varies greatly,* it is better to give a small dose at first. When it is determined that the patient can take arsenic, large doses should be given until some constitutional symptoms occur, when the medicine is discontinued for a few days. Or full doses of the liquid preparations gradually decreased to the minimum and as gradually increased may be given when it is desirable to continue the medicine for some time. Arsenic is less apt to disorder the stomach when freely diluted and taken after eating.

OLEUM MORRHUÆ—COD-LIVER OIL.

What is cod-liver oil?

Cod-liver oil is a *fixed oil* obtained from the fresh *livers* of Gadus morrhuæ, or codfish (*Class* Pisces; *Ord.* Teleostia; *Fam.* Gadida).

What are its principal chemical constituents?

It contains various fatty acids, several biliary principles, *gaduin*, *iodine*, *chlorine* and traces of *bromine*.

What are its physiological effects?

Cod-liver oil is more of a *food* than a *medicine*. It is readily absorbed, whether rubbed into the skin or taken internally. Oil is digested in the intestines (not in the stomach), and is readily assimilated, increasing the deposit of fat in the tissues and the number of corpuscles in the blood. In suitable doses it *improves* the *appetite* and *digestion* and *increases nutrition*. In large doses, or in very hot weather, it causes nausea and diarrhœa.

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* The author has seen gastro-enteric symptoms follow the administration of one dose of Fowler's Solution ♏j.

What are its therapeutic applications?

Cod-liver oil is used as a *nutrient* in chronic wasting diseases, particularly in *phthisis* (the earlier it is given, the more pronounced are its effects), also in *rickets*, *scrofula*, *chlorosis*, *rheumatoid arthritis*, *chronic rheumatism*, *chronic bronchitis*, *emphysema* and *chronic intestinal diseases* leading to mal-nutrition.

It is applied *locally for its constitutional effects* when it cannot be taken internally, and also in squamous skin affections.

What is the dose of cod-liver oil, and how should it be administered?

Oleum Morrhuæ (*cod-liver oil*) is given in doses of fʒj–f℥ss (3.696–15.0) t. i. d., and preferably ½ to 2 hours after meals. The *pure oil* is the best form for administration. If it nauseates, it may be given in emulsion with the hypophosphites, or with mucilage of acaciæ and oil of lemon. The addition of a few drops of ether renders it more easy of digestion.

THE PHOSPHATES AND HYPOPHOSPHITES.

What is the chemical difference between a phosphide, a phosphate and a phosphite?

A *phosphide* is formed by the direct union of *phosphorus*; a *phosphate* by the union of *phosphoric acid*, and a *phosphite* by the union of *phosphorous acid* with a base.*

What are the physiological actions of the phosphates and hypophosphites?

They increase the nutrition of the body.

Calcium phosphate exists normally in all the tissues of the body, and hence is an important nutrient. It is to this salt that bone owes its hardness.

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* In other words, whenever a salt ends in *ide* it is formed by the union of an element with a base (thus, iron ox*ide*, iron and oxygen; iron phosph*ide*, iron and phosphorus; iron iod*ide*, iron and iodine; iron sulph*ide*, iron and sulphur); when a salt ends in *ate*, it shows the union of an *acid ending in ic* with a base (thus, iron phosph*ate*, iron and *phosphoric acid;* iron sulph*ate*, iron and *sulphuric acid;* iron nitr*ate*, iron and *nitric acid*); when a salt ends in *ite*, it is composed of an *acid ending* in *ous* and a base (thus, sodium sulph*ite*, sodium and *sulphurous acid:* amyl nitr*ite*, amyl and *nitrous acid*, etc.).

What are the medicinal uses of these substances?

They are used as *alteratives* and *nutrients* in diseases of mal-nutrition, especially when these salts are wanting in the system, as in *rickets*, *mollities ossium*, *caries* and *necrosis*, *delayed union* of fractures, *superlactation*, *prolonged suppuration*, *anœmia*, *chronic diarrhœa* and *chronic phthisis*. The *hypophosphites* have been lauded in the treatment of phthisis, but probably act only as nutrients.

What are the preparations of these salts and their doses?

Calcii Phosphas Præcipitatus (*precipitated calcium phosphate*), a very insoluble preparation, and apt to form intestinal concretions; dose gr. v–x (0.324–0.648). It may be given in milk.

Syrupus Calcii Lactophosphatis (*syrup of calcium lactophosphate*); the addition of lactic acid renders the calcium phosphate much more soluble; dose f℥j–iv (4.0–15.0) t. i. d.

Calcii Hypophosphis (*calcium hypophosphite*); Potassii Hypophosphis (*potassium hypophosphite*); Sodii Hypophosphis (*sodium hypophosphite*), may each be given in doses of gr. x–xxx (0.648–1.944) t. i. d. Usually administered as

Syrupus Hypophosphitum (*syrup of hypophosphites*), dose f℥j–ij (4.0–8.0) t. i. d.

Syrupus Hypophosphitum cum Ferro (*syrup of hypophosphites with iron*) contains 1 per cent. of ferrous lactate; dose f℥j–ij (4.0–8.0) t. i. d.

The *ferric phosphates* and *hypophosphite* have been considered under iron; *sodium phosphate* will be mentioned with the cathartics.

CALCII CHLORIDUM—CALCIUM CHLORIDE.

What are the effects, uses, and doses of this salt?

Calcium chloride is a gastro-intestinal irritant, and is supposed to possess *alterative* powers in *strumous affections*, *glandular enlargements*, *uterine fibroid* and *ovarian tumors*. Dose gr. x–xx (0.648–1.296) in milk or water.

AMMONII CHLORIDUM—AMMONIUM CHLORIDE.

What are the effects, uses and doses of ammonium chloride?

In addition to the general effects of the ammonium salts (*q. v.*) it is an *alterative* and *expectorant*. *Locally* it is an irritant. *Internally*, in *small doses*, it stimulates the mucous membranes, increasing their secretions and epithelial exfoliation. It stimulates the intestinal glands and, perhaps, the liver. It aids the excretion of waste products and increases all the solids in the urine except uric acid. It is said to increase the menstrual flow in women. In *large doses* it irritates the stomach and intestines and proves purgative.

It is used as an *expectorant* (*q. v.*) and as an *alterative* in *enlarged glands*, *plastic exudations* (given internally and used locally), in *uterine fibroids*, functional *amenorrhœa*, in *muscular* and *chronic rheumatism* and *myalgia*, and in the early stages of *cirrhosis of the liver*. In *albuminoid* or *waxy infiltration of the liver*, *kidneys and spleen* it is a very valuable agent. It is also used in *neuralgia* and *neuralgic headache*. *Externally* it is applied as a *refrigerant* (℥j (31.10) to water Oss (120.0)) in the early stages of inflammation and in the later stages as a sorbefacient. Dose gr. v–xxx (0.324–1.944) every three or four hours, in compressed pills, capsules, or in solution with fluid extract of liquorice, which somewhat disguises its unpleasant taste.

COLCHICUM.

What is colchicum?

Colchicum is the *corm* and *seed* of C. autumnale or meadow saffron (*Nat. Ord.* Liliaceæ), a native of Europe.

What alkaloid does it contain?

It contains *colchicine*, which is converted by mineral acids into *colchicein*.

What are its physiological effects?

Locally applied it is *irritant*. *Internally*, *colchicum*, *or its alkaloid in small doses*, increase the secretions generally, particularly the urine, increasing greatly the amount of urea and uric acid eliminated; in *larger doses* it causes nausea and vomiting, frequent purging, and depresses the heart's action; in *excessive doses* it acts as an irritant poison, producing violent vomiting and purging, great depression, collapse and death by failure of respiration.

How should poisoning by colchicum be treated?

(1) Give emetics and cathartics; (2) tannic acid, as a partial anti-

dote; (3) demulcents, to protect the surfaces, and (4) opium and stimulants, to counteract the resulting depression.

What are the therapeutical uses of colchicum?

Colchicum is used as an *alterative* and *diuretic* in *acute gout* (often combined with magnesia and magnesium sulphate (Scudamore's draught) or with potassium iodide or other alkali) and in *rheumatism*. As a *diuretic* it is employed in ascites and other varieties of dropsy. As a *cholagogue* it is given in congestions of the portal circulation.

What are the preparations and doses of colchicum?

Extractum Colchici Radicis (*extract of colchicum root*), dose gr. j–ij (0.065–0.130) in pill.

Extractum Colchici Radicis Fluidum (*fluid extract of colchicum root*), dose ♏ij–iv (0.123–0.246).

Extractum Colchici Seminis Fluidum (*fluid extract of colchicum seed*), dose ♏ij–vj (0.123–0.40).

Tinctura Colchici (*tincture of colchicum*), made from the seed; dose fʒss–j (2.0–4.0).

Vinum Colchici Radicis (*wine of colchicum root*), dose ♏v–xx (0.308–1.232); as a purgative fʒss (2.0).

Vinum Colchici Seminis (*wine of colchicum seed*), dose ♏v–xxx (0.308–2.0)—the best preparation.

Colchicine (not official), dose for hypodermic use gr. $\frac{1}{60}$ (0.001).

SARSAPARILLA.

What is sarsaparilla?

Sarsaparilla is the *root* of smilax officinalis and other species of smilax (*Nat. Ord.* Smilaceæ), prickly shrubs of Mexico, Central and South America.

What special chemical principle does it contain?

A glucoside, called *smilacin* or *parillin*, which resembles saponin.

What are its effects and uses?

It has a very slight diaphoretic action, and in large doses is emetic and purgative. It is popularly supposed to depurate the blood. It has been used as an alterative in tertiary syphilis and in chronic rheumatism and various cachectic conditions.

What are its preparations and doses?

EXTRACTUM SARSAPARILLÆ FLUIDUM (*fluid extract of sarsaparilla*), dose fʒss (2.0) t. i. d.

EXTRACTUM SARSAPARILLÆ FLUIDUM COMPOSITUM (*compound fluid extract of sarsaparilla*), containing also sassafras, mezereon, and glycyrrhiza; dose fʒj (4.0).

DECOCTUM SARSAPARILLÆ COMPOSITUM (*compound decoction of sarsaparilla*), containing the above ingredients and guaiac wood; dose f℥iij–vj (80.0–200.0) t. i. d.

SYRUPUS SARSAPARILLÆ COMPOSITUS (*compound syrup of sarsaparilla*), containing guaiac wood, pale rose, senna, glycyrrhiza, sassafras, anise, and gaultheria. It decomposes corrosive sublimate, converting it into calomel. Dose f℥ss–j (15.0–30.0) t. i. d.

GUAIACI LIGNUM—GUAIAC WOOD.

GUAIACI RESINA—GUAIAC.

What are these substances?

Guaiacum wood, or lignum vitæ, is the *heart wood* of G. officinale and G. sanctum (*Nat. Ord.* Zygophyllaceæ), evergreen trees of S. America.

Guaiac is the *resin* of the wood of G. officinale, and is composed of *guaiaconic*, *guaiac* and *guaiacresinic acids*, *guaiac beta-resin*, *guaiac yellow* and *guaiacin*.

What are the effects, uses, preparations and doses of these substances?

Guaiac wood and resin slightly increase the secretions of the skin and mucous membranes, and in large doses prove emetic and cathartic. They have been used as *alteratives* in syphilis and chronic rheumatism, and also as *emmenagogues* in amenorrhœa and congestive dysmenorrhœa. In *tonsillitis* the tincture (fʒss (2.0) every 3 or 4 hours) is of value.

The preparations are TINCTURA GUAIACI (*tincture of guaiac*) and TINCTURA GUAIACI AMMONIATA (*ammoniated tincture of guaiac*); dose of either, fʒss–ij (2.0–8.0), 3 or 4 times daily, in milk.

MEZEREUM—MEZEREON.

What is mezereon?

It is the *bark* of daphne mezereum and other species of daphne

(*Nat. Ord.* Thymelaceæ), and contains daphnin (a bitter glucoside) and an acid resin. *Locally* it is irritant; *internally in medicinal doses* it increases the secretions, especially of the salivary glands, skin and kidneys; *in overdoses* it is an irritant poison and may cause death. It is *used* (generally with sarsaparilla) as an alterative in chronic rheumatism, tertiary syphilis and strumous affections, and as a *masticatory*, it has been chewed in paralysis of the muscles of the tongue and deglutition.

Extractum Mezerei Fluidum (*fluid extract of mezereon*), dose ♏x (0.616).

What is memispermum?

It is the *rhizome* and *roots* of M. canadense, yellow parilla or Canada moonseed (*Nat. Ord.* Menispermaceæ), and contains *berberine.* It is supposed to be *tonic*, *diuretic*, *diaphoretic*, and *alterative*, and is *used* as a substitute for sarsaparilla. The only preparation is the *fluid extract* (*extractum menispermi fluidum*), dose ♏v–xxx (0.308–2.0).

What is calendula?

Calendula is the *fresh flowering herb* of C. officinalis or marigold (*Nat. Ord.* Compositæ). It contains *calendulin*, and is supposed to be *diuretic*, *diaphoretic* and *alterative.* It is not much used.

Tinctura Calendulæ (*tincture of calendula*); dose f℥ss–j (2.0–4.0). It may be used externally (diluted) as an application to wounds and contusions.

What is sassafras?

Sassafras is the *bark* of the *root* of S. variifolium (*Nat. Ord.* Laurineæ), and contains a *volatile oil.* It is supposed to be a mild *alterative* and *diaphoretic*, and is *used* in combination with sarsaparilla. The *oil* is used as a flavoring ingredient and as a perfume.

Oleum Sassafras (*oil of sassafras*), dose gtt. ij–x (0.06–0.308).

What is stillingia?

It is the *root* of S. sylvatica or Queen's Delight (*Nat. Ord.* Euphorbiaceæ) and contains a *volatile oil* and a *resin.* It increases all the secretions and excretions, slightly stimulates the cardiac action and is believed to be alterative. It has been used in *secondary* and in *tertiary syphilis*, *scrofula* and *chronic rheumatism.*

Extractum Stillingiæ Fluidum (*fluid extract of stillingia*), dose fʒss (2.0).

What is dulcamara?

It is the *young branches* of solanum dulcamara, woody nightshade or bittersweet (*Nat. Ord.* Solanaceæ), and contains *solamine* and *dulcamarine*. It is feebly narcotic, diaphoretic and diuretic. In large doses it is a cardiac depressant. It sometimes causes nausea and vomiting. It is neither hypnotic nor anodyne. It is chiefly *used* as an alterative in chronic eczema, psoriasis, etc., and has been recommended in whooping-cough, bronchitis and asthma.

Extractum Dulcamaræ Fluidum (*fluid extract of dulcamara*), dose fʒss–j (2.0–4.0).

What is lappa?

Lappa or Burdoch is the *root* of Arctium Lappa and other species of Arctium (*Nat. Ord.* Compositæ). It contains a bitter extractive, perhaps a glucoside, tannin, resin, etc., and possesses tonic, laxative, and slight diuretic, diaphoretic, and alterant properties. It is *used* in chronic rheumatism, syphilis, and "scrofulous affections" and occasionally in chronic cutaneous diseases, as psoriasis and prurigo. Locally, it is used as an application to contusions.

Extractum Lappæ Fluidum (*fluid extract of lappa*), dose ♏xv–fʒj (0.924–4.0).

ORDER IV.—Antipyretics.

What are antipyretics, and how do they act?

Antipyretics are remedies which reduce temperature in fever, but in medicinal doses have little or no effect upon it in the normal condition. The temperature may be lowered (1) by *lessening the production of heat*, or (2) by *increasing the loss of heat*. Heat production may be diminished either (1) by *depressing nutrition* (*i. e.*, by retarding oxidation and cell-proliferation), or (2) by *depressing the circulation of the part* (as by local abstraction of blood, etc.), or of the system (cardiac sedatives); while the loss of heat may be increased (1) by *increased evaporation* from the surface (diaphoretics), (2) by *increasing heat radiation*, through dilatation of the cutaneous vessels (amyl nitrite, alcohol, etc.), or (3) by *direct withdrawal of heat* from the surface (cold applications, etc.). The antipyretic group of medicines act chiefly by their effects on nutrition.

Mention the principal antipyretics.

Antipyrine; acetanilid (antifebrin); phenacetin; phenacoll; quinine; salicin; salicylic acid and the salicylates; salol; salophen; guaiacol; resorcin; hydroquinone; pyrocatechin; chinoline; thalline and kairine.

ANTIPYRINE.

What is antipyrine?

Antipyrine (not official) is an alkaloidal substance usually synthetically prepared, but also obtained from the destructive distillation of coal tar, and belonging chemically to the phenyl group of carbon compounds. According to the latest investigations, antipyrine is a derivative of pyozol, which is derived from pyrrol.

What are the physiological effects of antipyrine?

Locally applied it is *antiseptic*, *antifermentative*, and *anæsthetic*. *Internally* it exerts its influence principally on *febrile temperature* and the *nervous system*, as an antipyretic and analgesic. In *fevers*, when an antipyretic dose (gr. xx–xxx (1.0–2.0)) is taken, the temperature rapidly falls several degrees (due principally to its direct action upon the heat-regulating apparatus of the nervous system, also partly to interference with the oxygen-carrying function of the blood, thus diminishing heat-production, and partly to dilatation of the cutaneous vessels, thus regulating heat-distribution and increasing heat-radiation), and more or less profuse sweating occurs. After an interval of from 4 to 12 hours the fever returns, sometimes preceded by a chill (which is not as severe as that caused by many of the other antipyretics, as kairine) and sometimes (very rarely) by depression almost amounting to collapse. Given in the same doses to a *healthy man* it only causes tinnitus aurium, nausea, and a slight fall of temperature (about $\frac{1}{10}$°); *large doses* (ʒj (4.0)) cause vomiting and giddiness.

Antipyrine is quickly absorbed, and probably interferes with nutrition by combining with the hæmoglobin of the red corpuscles, forming methæmoglobin (the face becomes livid and the lips bluish when large doses are taken). It does not permanently impair their function nor alter their form. Medium doses stimulate the heart and raise the arterial pressure (partly from spasm of the internal vessels); very large doses (in animals) directly paralyze the heart and lower the blood-pressure. Small doses have little or no effect upon the respiration. Given in large doses it increases the rapidity of the respiration and in poisonous doses it causes death apparently by respiratory paralysis. This action appears to be centric. It is a cerebral sedative and analgesic, acting especially on the sensory nerves, and dilates the pupils. It is eliminated by the kidneys, and when the perspiration is slight increases the urine. It sometimes produces a cutaneous rash and (very rarely in therapeutic doses) induces vomiting. It is said to be hæmostatic.

What are the symptoms of poisoning by this drug?

When an overdose is taken there are often nausea and vomiting, a sense of fulness in the head, tinnitus aurium. relaxation of the muscular system and muscular weakness, cyanosis, cutaneous eruptions, sweating, rapid breathing, and feeble pulse. Occasionally the reflexes are absent. Consciousness is retained.

How should these symptoms be treated?

The treatment consists in keeping the patient in a recumbent position; maintaining the body-heat; administering alcoholic and diffusible stimulants; giving atropine hypodermically and, if the cyanosis is marked, inhalations of alcohol.

The profuse sweating which is sometimes seen is best combated by giving atropine or agaricine.

The cutaneous eruptions rapidly disappear when the drug is discontinued.

What are its therapeutic uses?

It is used as an *antipyretic* in all cases ot *hyperpyrexia*, as in *typhoid fever*, in *sunstroke* with high temperature, in the *exanthemata*, *surgical fever*, *pneumonia*, *erysipelas*, and *influenza*. In *acute rheumatism* it not only lowers temperature but relieves the pain. It is not an antiperiodic, but may be used to reduce the temperature in *malarial fevers*.

As an *analgesic* it is much employed in *neuralgiæ*, the "lightning-pains" of *locomotor ataxia*, *muscular rheumatism*, *myalgia*, *dysmenorrhœa*, to allay the pains of the first stage of *labor*, and in *influenza*. In *acute coryza* it is useful as a spray to the nasal mucous membrane (4 per cent. solution), preceded by the local application of cocaine.

What is the dose of antipyrine, and how may it be administered?

The dose as an *antipyretic* is gr. xv–xxx (1.0–2.0), repeated as circumstances require; as an analgesic, gr. x–xv (0.648–1.0), repeated in from 1 to 4 hours, if necessary. It is given in capsules or in solution. As it is non-irritating, it may be used hypodermically.

It is incompatible with calomel and with sweet spirits of nitre, tannates, and solutions of chloral, mercury, arsenic, and carbolic acid.

ACETANILIDUM—ACETANILID.

What is acetanilid?

Acetanilid or *antifebrin* is a neutral chemical product, obtained by the action of glacial acetic acid and heat on aniline. It is an acetyl derivative of aniline and is known chemically as phenylacetamide (C_6H_5NH,C_2H_3O).

What are its physiological actions?

Like antipyrine, *acetanilid* is markedly *antipyretic* and *analgesic*. 78

As an antipyretic *in fevers* it acts more slowly than antipyrine, influencing the temperature in the same manner and being attended with the same symptoms and with more marked cyanosis. As the temperature declines the pulse becomes slower and stronger and the arterial tension is elevated. Gastric and intestinal disturbance and other unpleasant concomitants rarely result. Given to *healthy men* in ordinary doses it produces no apparent effect. In *decided doses* acetanilid lessens the conductivity of nerves, depresses the reflex centres, and acts as a hypnotic. In *poisonous amounts* it causes motor and sensory paralysis. Its effects are chiefly expended upon the sensory cord and nerves. Given to animals *in toxic doses*, beside cyanosis it causes general prostration, stupor, rapidly lowered temperature, with primary stimulation and afterward depression of the heart and respiration, coma, convulsions, and death. It is eliminated by the kidneys as para-amido-phenol sulphate.

What are its uses?

It is used as an *antipyretic* in all cases of high temperature, as *typhoid fever*, *acute rheumatism*, *scarlatina*, *phthisis*, *influenza*, *pneumonia*, and *acute sepsis*. As an *anodyne* it is employed, also, in the same diseases in which antipyrine is indicated, and has been found useful in *epilepsy*, particularly in the lesser attacks (*petit mal*). It is also used *locally* as an *antiseptic*.

How may it be administered, and in what doses?

The dose of acetanilid is from gr. iv–x (0.25–0.64). It is quite insoluble in water, and is better given in capsules or in powder.

PHENACETIN.

What is phenacetin?

Phenacetin or *acetphenetidin* (not official) is an acetyl derivative of amido-phenol.

What are its physiological effects?

It is a nervous sedative, acting principally upon the sensory portions of the spinal cord.

In small doses it has no effect upon the circulatory system. Large doses produce a general cyanosis due to the formation in the blood of methæmoglobin.

It slightly depresses normal temperature, and reduces markedly that of fever, usually causing but slight diaphoresis. When administered in the evening its effects upon febrile temperature appear to be more marked than when given in the morning. After large doses, in addition to cyanosis, vomiting, incoördination, hurried breathing, and somnolence may occur.

What are its therapeutic uses and doses?

As an *antipyretic* in febrile conditions generally, as in *typhoid fever*, *pneumonia*, *pleurisy*, *tuberculosis*, *influenza*, *acute rheumatism*, etc.

As an *analgesic* in *migraine*, *headache* from any cause, *myalgia*, etc. It is better to administer this, as well as the other coal-tar products, cautiously in all cases of weak heart. Dose gr. iij–xx (0.2–1.29).

PHENOCOLL.

What is phenocoll?

Phenocoll (not official) or *amidophenacetin* is a coal-tar product prepared "by the action of glycocoll, which is amido-acetic acid, upon phenacetin."

It is a white crystalline powder and is soluble in 16 parts of water. It is incompatible with the alkalies.

It is said to reduce febrile temperature very rapidly by diminishing the heat-production without affecting the heat-radiation, and to have no unpleasant sequelæ, except occasionally profuse perspiration.

It should be used with care, however, in all cases of prostration, as it may then produce cyanosis and cardiac depression. It has been used as a hydrochloride for its *antipyretic* effect in various febrile conditions; as an *analgesic* in *acute rheumatism* and in *neuralgia*, and as a *sedative* in *whooping-cough.* Dose of the hydrochloride gr. v–xv (0.32–1.0).

QUININE.

Is quinine used as an antipyretic?

Quinine (*vid.* p. 00) was formerly much used for this purpose, but at the present time it has been largely superseded by other agents.

As an antipyretic it is given in doses of gr. x–xx (0.64–1.30) repeated as required.

SALICIN, SALICYLIC ACID, AND THE SALICYLATES.

What are these substances, and whence are they obtained?

Salicin is a neutral principle found in several species of salix. *Salicylic acid* is a derivative of salicin, is found also as a salt (of methyl) in oil of gaultheria, and has been prepared synthetically by combining pure carbolic acid with dry carbon dioxide by means of heat. The *salicylates* are the salts formed by the union of this acid with bases.

What are the physiological effects of these substances?

The effects of *salicin* resemble those of salicylic acid, but its action is slower and less powerful. It is *antipyretic*, *tonic*, *antifermentative*, *antiseptic*, and to a slight extent *antiperiodic.* It does not depress the heart to the same extent as does salicylic acid, and is much less toxic. It is eliminated by the urine (chiefly as salicylic and salicyluric acids) and by the perspiration, rendering both of these excretions alkaline.

Salicylic acid, when *locally* applied, is *antiseptic* and *antifermentative.* Administered *internally in full doses* it lowers the temperature in fevers, causes profuse, sometimes exhausting sweats, and produces symptoms similar to those of *cinchonism*, such as tinnitus aurium, partial deafness, headache, etc. After very *large doses* these symptoms are all increased, and dyspnœa, with depression of the heart and nervous system and dilated pupils, is observed. If a *toxic dose* be given, delirium, irregular respiration, involuntary evacuations, stupor, and death from respiratory failure occur. In healthy subjects salicylic acid in full doses often causes nausea and vomiting, is a cardiac depressant, inhibits the movements of the leucocytes, quickens and deepens the respiratory movements (producing dyspnœa), is a diaphoretic, does not affect the normal temperature, and is eliminated chiefly by the urine, which, if large amounts have been taken, will be of a green color (due to an increase of indican). The urine frequently contains albumin.

The salicylates administered internally are less irritant to the stomach than is salicylic acid; in other respects their effects are identical.

What are the medicinal uses of these substances?

Salicin is not much employed. It has been used as an *antipyretic*, especially in rheumatism, for which purpose gr. iij–xv (0.2–1.0) may be given every few hours.

Salicylic acid has been given as an *antipyretic* in various fevers, but is now little used for this purpose except in *acute rheumatism* in robust subjects, where it not only lowers the temperature and moderates the pain, but materially aids in the elimination of uric acid, yet probably does not decrease the frequency of cardiac complications. It is also used successfully in *pleurisy with effusion*. It has also been used with success as an *anthelmintic*. *Externally* it is applied for the removal of corns and warts; to check sweating of the feet; in eczema; and as an *antiseptic* to wounds and ulcers.

The *salicylates* are used internally as *antipyretics* in *acute rheumatism* and as *antizymotics* to prevent *fermentation* of food in the stomach.

What are the preparations and doses of these remedies?

SALICINUM (*salicin*), dose gr. x–ʒj (0.648–4.0). In acute *rheumatism*, gr. iij–xv (0.2–1.0) may be given every few hours.

ACIDUM SALICYLICUM (*salicylic acid*), dose gr. x–ʒj (0.648–4.0).

In *acute rheumatism*, gr. x (0.648) may be administered every hour until six doses are taken. If more is necessary, decrease the frequency of the dose.

SODII SALICYLAS (*sodium salicylate*) (ʒj (0.648) contains of salicylic acid gr. 48 (3.12); dose gr. v–ʒj (0.324–4.0). It is more soluble and less apt to cause vomiting than the acid, and hence is preferred for internal use.

LITHII SALICYLAS (*lithium salicylate*) is used for the same purposes and in the same doses.

METHYL SALICYLAS (*methyl salicylate—artificial* (or synthetic) *oil of wintergreen*) is a product obtained by the distillation of salicylic acid, or its salts, and methyl alcohol in the presence of sulphuric acid. It is identical with volatile oil of betula and differs in no respect from the other salicylates either in physiological action or in therapeutic use. It is less irritating to the stomach than the oil of gaultheria. Dose ♏j–v (0.06–0.31).

Phenyl salicylate will be described under the head of "*salol.*"

Physostigmine salicylate will be spoken of in connection with physostigma.

What other official preparations are used for the salicylate which they contain?

OLEUM GAULTHERIÆ (*oil of gaultheria*), a volatile oil distilled from Gaultheria procumbens or wintergreen. It contains *methyl salicylate*, and acts similarly to salicylic acid upon the system. In large doses it is toxic. It is administered for the same purposes as are the salicylates in doses of ♏x–xv (0.61–0.92) in capsules, repeated as required.

OLEUM BETULÆ VOLATILE (*volatile oil of betula—oil of sweet birch*), a volatile oil obtained by distillation from the bark of Betula lenta (*Nat. Ord.* Betulaceæ). It is identical with methyl salicylate and nearly identical with oil of gaultheria. Dose ♏j–v (0.06–0.31).

What should be done if, during the use of these medicines, tinnitus aurium or other symptoms of intoxication should occur?

The dose should immediately be decreased or the medicine discontinued.

SALOL.

What is salol?

Salol (*phenyl salicylate*) is the salicylic ether of phenol and occurs as a white crystalline, slightly aromatic, and nearly tasteless powder, insoluble in water, but soluble in alcohol.

What are its physiological effects?

Locally it is *antiseptic*. *Internally* it lowers febrile temperature and produces sweating. The circulation is practically uninfluenced; the respirations increase in frequency and become shallow, tinnitus aurium and other salicylic acid symptoms sometimes occur. It is somewhat analgesic. In the intestine the pancreatic juice converts it into salicylic and carbolic acids, which render antiseptic the remainder of the alimentary canal. It seems to make the bile more watery. It is eliminated chiefly in the urine, which after its use resists decomposition and becomes darker in color.

What are its uses and doses?

As an *antipyretic* it is used in *acute rheumatism*, in *typhoid* and other *fevers*; in *phthisis* and in *pneumonia*; as an *intestinal antiseptic* in *duodenal catarrh*, *catarrhal jaundice*, *typhoid fever*, and *cholera*; to *prevent decomposition of urine* in *cystitis* and *pyelitis*, and as an *analgesic* in *neuritis*, *neuralgia*, *nervous headache*, etc. It is also employed in *pharyngitis* and in *chronic sore throat* depending upon the uric acid diathesis. It may be given in any stage of *gonorrhœa* for its influence on the urine. It is also said to be useful in diabetes.

Locally it is used as an antiseptic in surgical dressings. Dose gr. v–ʒj (0.324–4.0) in pills, capsules, or in solution in alcohol or oil. It should be administered cautiously in disease of the kidneys, because of the carbolic acid which it contains.

SALOPHEN.

What is salophen?

Salophen (not official) is acetylpara-amidophenol salicylate. Like salol it is decomposed in the intestine by the pancreatic juice, being split into salicylic acid and actylpara-amidophenol, which is harmless, thus possessing an advantage in point of safety over salol. It is chiefly eliminated under these forms in the urine, a small quantity passing unchanged in the stools. It is an *antipyretic*, *intestinal antiseptic*, and *analgesic*. Its most marked antipyretic effect is seen in *acute rheumatism*. It has also been used as an *intestinal antiseptic* in *typhoid fever*, *cholera*, and *dysentery*, and as an *analgesic* in *sciatica*, *migraine*, and *neuralgia*. It appears to be non-toxic. Dose gr. x–xv (0.64–1.0) in compressed pill or capsule every 2 hours until gr. xc (6.0) are taken in 24 hours.

GUAIACOL—GUAIACOL CARBONATE.

What are guaiacol and guaiacol carbonate?

Guaiacol (not official) or methylpyrocatechin is a colorless volatile liquid, with a strong aromatic odor, prepared by the fractional distillation of beechwood creasote, of which it forms 60 to 90 per cent.

It is also prepared by the dry distillation of guaiac resin, and, synthetically by the action of methyl-sulphuric acid upon pyrocatechin. The latter product is the purest form of guaiacol.

It is slightly soluble in water (1 part in 85, Helbing), but more so in ether and alcohol.

Guaiacol carbonate (not official) is made "by decomposing guaiacol in a solution of soda with carbonyl chloride. It is a neutral, white, crystalline powder, containing 91 per cent. of chemically pure guaiacol in combination with 9 per cent. of carbonic acid." Insoluble in water and in cold alcohol, it dissolves readily in ether, in chloroform, and in boiling alcohol, sparingly in the fixed oils and in glycerin.

What are their effects?

When guaiacol is given internally or administered hypodermically to healthy persons it produces no effects beyond slight depression and slight diaphoresis. When given in suitable doses to febrile patients a gradual *reduction of the febrile temperature* takes place, the fever declining for from 2 to 4 hours. When the lowest point has been reached the temperature rises rather rapidly to its former height, half the time being occupied in the ascent which was required for the decline of the temperature. As the temperature falls the patient often complains of much depression, but in ordinary doses the effects upon the respiration and pulse are evanescent.

It is eliminated by the lungs and kidneys as guaiaco-sulphuric ether, giving a dark color to the urine when a large dose has been taken.

There is but one case of poisoning on record. *When applied locally* it is *antipyretic* and *analgesic.* It rapidly lowers febrile temperature, the subsequent rise being, as when it is administered internally, much more rapid than the fall. There are also profuse sweating and feeble cardiac action approaching syncope.

The action is most pronounced when applied to the abdomen, not so marked when rubbed on the chest, and least marked when applied to the thigh (Da Costa), probably because of the relative absorptive powers of different parts of the body.

It appears to lower the temperature by direct action on the thermogenetic centres. Guaiacol is also an *antiseptic.*

The carbonate when given internally is antipyretic, and, being decomposed in the small intestine into pure guaiacol and carbonic acid, acts as a local antiseptic upon the alimentary canal.

For what purposes are they employed?

They are much used as substitutes for creasote in the treatment of *pulmonary tuberculosis*, acute or chronic, especially in the first and second stages of the disease. In suitable cases it lessens the fever, improves the appetite and digestion, and moderates the cough.

By some "it is believed that it forms compounds in the blood with the toxins produced by the presence of the bacillus tuberculosis in the organism, and that it aids in eliminating them from the system." It may be used internally, either by inhalation or by hypodermic injection, or it may be applied locally. The internal use of the carbonate is probably to be preferred in these cases.

In *typhoid fever* as an *antipyretic* when the cold bath cannot be employed or is contraindicated, and as an *intestinal antiseptic*, guaiacol is very useful, employed locally and given internally in the form of the carbonate.

It has also been used as an *antipyretic* in other acute infectious diseases accompanied with high temperature, as in *pneumonia*, *influenza*, *erysipelas*, etc., and has been used for its *diaphoretic* action in *pleurisy* with effusion, as a means of promoting absorption.

As an *analgesic* it has been successfully used in *sciatica* and in various *neuralgiæ* painted over the painful areas, and has also been used locally in *arthritis deformans* as a pain-relieving agent. In the latter affection the author has not seen the beneficial effects which have been produced by this agent in the hands of other physicians.

In *acute rheumatism* with high fever its local application in selected cases is of value.

It has also been used locally in *follicular tonsillitis*, and while not curative, will relieve the pain and enable the patient to swallow more easily. In *gonorrhœal epididymitis* painted over the scrotum it is said to relieve the pain quickly.

It has also been recommended as a *local anæsthetic* in dental and minor surgical procedures.

It is used as an *inhalation* in *fetid bronchorrhœa* and in *gangrene of the lung*. Dose of guaiacol ♏iij–v (0.18–0.3) four times a day in capsule, pill, or in solution in oil or alcohol. Hypodermically gr. j–iv (0.06–0.2) in sterilized oil may be used. The smaller dose should always be administered at first and gradually increased.

Locally ♏v–xl (0.3–2.0) may be employed. When used in this manner the skin should be thoroughly cleansed and the guaiacol applied with a camel's hair pencil and rubbed in until absorbed. The surface should then be covered with oiled silk or paraffin paper to prevent evaporation.

As an inhalation ♏v–x (0.3–0.6) in a pint of hot water may be used, or an oxygen inhaler may be employed.

Guaiacol carbonate is preferable for internal administration, as it is free from the odor and taste of guaiacol, which are objectionable to many persons, and does not irritate the alimentary canal. It is used in *tuberculosis* and *typhoid fever*. Dose gr. v (0.3) t. i. d. in capsules increased gradually until gr. xlv (3.0) are taken in divided doses in 24 hours.

What other antipyretics are occasionally used?

Resorcin; hydroquinone; pyrocatechin; chinoline; thalline, and kairine, of which only the first is official.

Describe their effects and uses.

Resorcin (*resorcinum*), *hydroquinone, and pyrocatechin* are isomers, being respectively meta-, para-, and ortho-oxyphenol.

Locally they are antiseptic and antifermentative. *Internally* they reduce febrile temperature and cause profuse diaphoresis, followed by a more or less well-marked chill and gradual return of the fever. Fulness of the head or headache, flushed face, and tinnitus aurium accompany these effects; the pulse and respiration are at first accelerated but soon depressed. Large doses given to animals cause tremor, epileptiform convulsions, weak and rapid pulse, and finally failure of respiration. They are eliminated by the urine.

Chinoline is antiseptic and antipyretic, acting very similarly to resorcin: It depresses the heart and respiration, and paralyzes the reflex centres.

Kairine is also antipyretic, often causing much depression and acting dangerously on the blood.

Thalline is a synthetically prepared alkaloid used in the form of sulphate or tartrate. It is antipyretic, but causes profuse diaphoresis with, sometimes, dangerous depression almost amounting to collapse.

These substances have been used in all cases of high temperature as antipyretics, but have been superseded by newer and less dangerous drugs.

Resorcin is used *locally* as an *antiseptic*, *analgesic*, and *caustic*. In purulent and offensive discharges from the *nose*, *ears*, or *vagina* an injection of the strength of gr. x–xx (0.64–1.29) to f℥j (30.0) of water may be used. In *chronic otitis media* it may be applied diluted with 7 parts of boric acid. It has also been used locally to the larynx in *pertussis*, in *chronic aphonia*, and to stimulate *chronic ulcers of the larynx*. In the form of ointments varying in strength from 1–50 per cent. it has been used in *chronic cutaneous diseases*, especially those of bacterial origin.

Of *resorcin* the dose is gr. v–xxx (0.32–2.0) in solution; of *hydroquinone* and *pyrocatechin* gr. ij–x (0.13–0.64); of *chinoline* gr. vii–xv (0.32–1.0) in solution in oil; of *kairine* gr. vij–xx (0.32–1.3); and of *thalline* gr. ij–xv (0.13–1.0) in pills or capsules.

Class II.—Medicines acting on the body by their effects on the various organs.

(A) ON THE NERVOUS SYSTEM.

ORDER I.—HYPNOTICS.

What are hypnotics?

Hypnotics are remedies which are administered to induce sleep. Most of them are *narcotics*, or remedies which by a stupefying effect on the nerve centres, diminish our relationship with external nature; and many of them are also *anodynes*, or remedies which by lessening the excitability of the nerves and nerve centres, tend to relieve pain.

How do hypnotics act?

As *during sleep* the functional activity of the brain is depressed, while the nutritive function is active, and as it is necessary for the nutrition of an organ that the blood should pass through the capillaries in a slow, steady and continuous stream, removing the waste products and giving up substances capable of replacing the tissue destroyed, while *during functional activity* the blood is in larger amount, hurried through the vessels (which are dilated) in a tumultuous manner, and does not remove the waste as fast as it accumulates in the tissues, therefore a medicine to cause sleep must *depress the cerebral functions* or *regulate the blood supply* to the brain by either contracting its vessels or by determining more blood to other portions of the body.

Name the principal hypnotics.

Opium and its alkaloids; chloral; chloralamide; chloralose; the bromides; hyoscine; sulphonal; trional; tetranal; paraldehyd; urethan; cannabis Indica; humulus, and lactucarium.

OPIUM.

What is opium?

Opium is the *concrete milky exudation* of the unripe capsules of Papaver somniferum (*Nat. Ord.* Papaveraceæ), a native of Persia but cultivated throughout the civilized world.

What are its principal chemical ingredients?

It contains the following *alkaloids:* Morphine, narcotine, codeine, narceine, paramorphine (thebaine), papaverine, pseudomorphine, laudamine, hydrocotarnine, cryptopine, porphyroxine, meconine and others.

These are in combination with meconic and thebolactic acids.

What are the chemical tests for the presence of opium?

With even very diluted *solutions of opium*, *ferric chloride or sulphate* produces a blood-red ferric meconate. With *morphine and its salts*, *ferric chloride or sulphate* gives rise to a deep blue color, while *concentrated nitric acid* strikes with them a rich orange-red, slowly fading to yellow.

What are the physiological actions of opium?

Opium is hypnotic, anodyne, antispasmodic and diaphoretic. It also depresses the circulation and respiration. A *moderate dose* at first slightly stimulates, then calms, and finally depresses the *cerebral* functions, consciousness finally being lost in sleep, which is often disturbed by dreams; the reflex centres are depressed, and if the dose be toxic, finally paralyzed, death occurring from paralysis of the respiratory centre. The pupil is contracted from stimulation of the 3d pair of nerves. It depresses the *cardiac* motor ganglia, the pulse becoming slower and fuller and the arterial tension elevated. *Respiration* is slowed. The *secretions* are all diminished, except that of the skin, which is increased. Peristalsis is retarded. *Elimination* takes place chiefly through the kidneys. Occasionally, intense itching of the skin, and sometimes cutaneous rashes occur. Headache, nausea and constipation commonly follow a medium dose of opium.

What are the symptoms and treatment of opium poisoning?

The *symptoms* of opium-poisoning may be divided into three stages:

The first stage—not always present, and when present usually of short duration—in which there is mental exhilaration or excitement, with some confusion of ideas; a sensation of heat and often itching of the nose and face; a dry skin; and sometimes nausea and vomiting. This quickly passes into

The second stage, in which there is overpowering drowsiness, passing into stupor; contraction of the pupils; dryness of the mouth and throat; sweating; full, regular respirations, diminishing in frequency as the poisoning proceeds; and congested face. This stage gradually passes into

The third stage, with deepening coma; minutely contracted pupils (pin-point pupils); very slow, stertorous breathing; abolition of reflexes; pale, cyanosed face; rapid, feeble circulation, and death from respiratory failure.

Before death occurs the pupils often become widely dilated.

Death has resulted, in an adult, from morphine gr. $\frac{1}{4}$, hypodermically (rare), and from opium gr. ivss (rare). Children are very susceptible to its action.

Treatment.—(1) Remove any poison present in the stomach by the stomach pump or emetics (zinc sulphate gr. xx–xxx, or cupric sulphate gr. v–x in a glass of tepid water, or apomorphine gr. $\frac{1}{16}$, hypodermically); (2) Catheterize the patient to prevent resorption of the opium from the urine; (3) Maintain respiration and circulation by hypodermics of atropine sulphate gr. $\frac{1}{60}$, repeated in half the amount at the end of 15 to 30 minutes if necessary, the guide to its administration being the respiration. Strychnine, caffeine or cocaine are also recommended. Faradization, cold effusions and artificial respiration are useful. Potassium permanganate has been, of recent years, strongly recommended as an antidote to opium-poisoning. While it is not probable that it can act on the opium after the latter has been absorbed, yet it is well to employ a solution of the permanganate in washing out the stomach.

Post-mortem examination shows no characteristic changes in the organs.

How does the action of its alkaloids differ from that of opium?

The action of *morphine* differs from opium in that the former is less constipating, less of a diaphoretic, and about four times more powerful in other respects. *Codeine* is uncertain as an anodyne and hypnotic, but appears to possess a sedative effect on the vagus, thus quieting cough and bronchial irritation. The results of experiments with the other alkaloids are so conflicting that no reliance can be placed in them.

In what diseases is opium used medicinally?

As an *anodyne* opium or morphine is used in almost all diseases of which pain is a prominent and persistent symptom, and is only contraindicated when acute inflammation of the brain is present.

As a *hypnotic* in *delirium tremens* (often combined with the bromides or chloral) and in *sleeplessness* of fevers and other acute diseases; to *allay irritation*, especially when accompanied with *painful spasm*, as in the various forms of *colic* or in *asthma* (morphine hypodermically); in *severe acute vomiting* (by suppositories); to *check morbid discharges* or *restrain peristalsis*, as in *cholera*, *diarrhœa*, *dysentery*, and *enteritis*. In *peritonitis* for the latter effect and as an *anodyne*, large doses are required, a tolerance to opium being established.

In *puerperal septicœmia*, to *support the system* and as an *anodyne* it is of great value. As a *motor depressant* in *cerebro-spinal fever* very large doses are tolerated; also in *urœmic convulsions* (dangerous if the renal structure is much diseased), *puerperal eclampsia*, *tetanus*, *hydrophobia* and other affections with increased excitability of the reflex centres. In the *early stages of various inflammations*, for its influence on the circulation and tendency to retard effusion and relieve pain, and as a *diaphoretic* (Dover's powder) in muscular rheumatism, the early stages of acute catarrhs, etc., it is much employed. In *diabetes* opium and codeine are most reliable drugs to decrease the amount of sugar in the urine. *Great caution* should be exercised in prescribing opium in chronic diseases, as the *opium-habit* is almost certain to result. *Locally* opium is applied in solution as anodyne and sedative.

What are the preparations and doses of opium and its alkaloids?

OPII PULVIS (*powdered opium*) contains not less than 13 nor more than 15 per cent. of morphine. It is used in making the other preparations.

OPIUM DEODORATUM (*deodorized opium*) contains 14 per cent. of morphine; dose gr. ss–ij (0.032–0.130).

PILULÆ OPII (*opium pills*), each pill contains of powdered opium gr. j (0.065).

EXTRACTUM OPII (*extract of opium*), dose gr. ss (0.032).

Emplastrum Opii (*opium plaster*) contains the extract with Burgundy pitch and lead plaster.

Trochisci Glycyrrhizæ et Opii (*troches of glycyrrhiza and opium— Wistar's cough lozenges*); each lozenge contains of extract of opium gr. $\frac{1}{20}$ (0.003). Very useful in laryngeal and pharyngeal coughs.

Pulvis Ipecacuanhæ et Opii (*powder of ipecac and opium—Dover's powder*) is a diaphoretic and anodyne; dose gr. x (0.648), containing of opium and ipecac each gr. j (0.06) with sugar of milk.

Tinctura Opii (*tincture of opium—laudanum*), dose ♏xij or 25 drops (0.74).

Tinctura Opii Deodorati (*tincture of deodorized opium*), dose ♏xij (0.74).

Tinctura Opii Camphorata (*camphorated tincture of opium—paregoric*) contains opium, diluted alcohol, oil of anise, benzoic acid, glycerin, and camphor; dose f℥j–iv (3.696–14.786). To a young child gtt. iij–xx (0.185–1.232), according to age.

Tinctura Ipecacuanhæ et Opii (*tincture of ipecac and opium*). This is Dover's powder in a fluid form. Dose ♏xij–xx (0.74–1.232).

Acetum Opii (*vinegar of opium—black drop*), dose ♏xij (0.74).

Vinum Opii (*wine of opium—Sydenham's laudanum*), dose ♏xij (0.74).

Morphinæ Sulphas (*morphine sulphate*); Morphinæ Hydrochloras (*morphine hydrochlorate*); Morphinæ Acetas (*morphine acetate*). The salts are preferred to the pure alkaloid because they are more soluble. Dose of either gr. $\frac{1}{6}$–$\frac{1}{4}$ (0.010–0.016) is equal to opium gr. j (0.065). They are well adapted to hypodermic use.

Pulvis Morphinæ Compositus (*compound powder of morphine—Tully's powder*) contains of morphine sulphate 1 part, with 20 parts each of camphor, liquorice, and calcium carbonate; dose gr. v–xv (0.324–0.972).

Trochisci Morphinæ et Ipecacuanhæ (*troches of morphine and ipecac*). Each lozenge contains of morphine sulphate gr. $\frac{1}{40}$, (0.0016) and of ipecac gr. $\frac{1}{12}$ (0.005).

Magendie's solution (not official) contains of morphine gr. xvj to the ounce. It is sometimes used hypodermically, but it is better to make a fresh solution of morphine for each injection, as bacteria frequently develop in solutions of the alkaloids when kept for some time, and also because otherwise there is some risk of confusion, as the French Magendie's solution contains about gr. xijss to the ounce. Also the solutions of morphine official in the British Pharmacopœia do not correspond in strength to either of the above solutions.

CODEINA (*codeine*), dose gr. ¼–ij or even gr. v (0.016–0.130–0.32).

What medicines are incompatible with opium?

The alkalies precipitate morphine from solutions of opium and vegetable infusions containing tannic acid form a less soluble tannate of morphine; many mineral salts are also decomposed by solutions of opium.

How is opium administered?

Opium is often administered in the form of the officinal preparations, either alone or combined with other substances. The bromides, chloral or other hypnotics are often added to increase its soporific influence; belladonna, etc., to enhance its anodyne effects; lead or other astringent to act more powerfully in intestinal disorders; potassium nitrate, or minute doses of antimony, to increase, while atropine is often combined with morphine to diminish, its action as a diaphoretic. It may be administered by the mouth or rectum (suppositories or laudanum enemata), and its alkaloids may also be given hypodermically.

CHLORAL.

What is chloral?

Anhydrous chloral is an oily liquid made by saturating absolute alcohol with dry chlorine gas, and is tri*chloral*dehyd. By uniting with water, a hydrate, the *official chloral*, is formed, which occurs as a crystalline solid.

What are its physiological effects?

Locally applied, chloral is antiseptic and irritant. Given *internally*, it is a hypnotic, motor depressant and cardiac sedative. In *medicinal doses*, it causes quiet, natural sleep, contraction of the pupil and deep, regular breathing. After *large doses*, the sleep is deeper and may even pass into coma, respiration is slowed, the cardiac action is weakened and diminished, the temperature falls, and sensibility and reflex action are depressed. It is not an anodyne.

Nausea and vomiting sometimes occur from its irritant action on the mucous membrane, and in some persons excitement and even delirium may take the place of the sleep which it usually produces. The *continued use* of chloral causes *chloralism* or the *chloral habit*, and produces an anæmic condition, with weak, irregular heart, irritable temper and loss of self control: a state similar to delirium tremens has been observed.

What are the symptoms and treatment of chloral poisoning?

After toxic doses, profound narcosis, great muscular relaxation, slow and very weak pulse, diminished frequency of breathing, marked contraction of the pupil and lividity of surface, with great reduction of body heat, occur. Death is due to paralysis of respiration or to sudden failure of the heart from paralysis of its motor ganglia.

The smallest recorded fatal dose is gr. xxx (2.0).

The *treatment* for chloral poisoning consists in (1) maintaining the temperature by artificial heat; (2) maintaining the cardiac action by *atropine* in small doses, repeated as required, and (3) maintaining the respiration (partly by the atropine or by morphine, and partly by artificial manipulations). While chloral is the best antidote for strychnine poisoning, the converse does not hold good.

What are its therapeutical uses?

As a *hypnotic*, chloral is employed in *insomnia*, *hysterical* or *maniacal excitement*, and in *delirium tremens* and *mania-a-potu*, but is *contraindicated* in any condition where the heart is weak or has undergone fatty degeneration. As a *motor depressant* in *uræmic*, *infantile* or *puerperal convulsions*, in tetanus, and in poisoning by *strychnine*, it is of great service, and has been used in *whooping-cough* and *chorea*. It is also recommended in sea-sickness (gr. v t. d.) and to relax a rigid cervix during the first stage of labor. *Locally*, in diluted solution, it has been used as an *anodyne and antiseptic* dressing, and, triturated with equal parts of camphor, it forms a valuable liniment in neuralgic and muscular pains.

How is chloral administered?

The dose of chloral is gr. ij–xx (0.130–1.296), which may be repeated in an hour or two if sleep is not produced. It is better given in syrup. It should not be given with alkalies, which decompose it, chloroform and formic acid being formed.

What is croton-chloral hydrate?

Croton-chloral hydrate (not official), or butyl-chloral hydrate, is made by the action of chlorine gas on ethylic aldehyd, and occurs in small, glittering crystals. Its *effects* and *uses* are similar to those of chloral, and as it possesses a very decided anæsthetic influence over the filaments of the trigeminii, it is much used in the neuralgiæ affecting the branches of these nerves. Dose gr. v–xx (0.324–1.296), in glycerin or syrup.

CHLORALAMIDE.

What is chloralamide?

Chloralamide (not official) is a compound prepared by the action of formamide upon chloral. It is soluble in water, but more so in alcohol. *Its action* is similar to that of chloral, but it is not so certain a hypnotic, and neither depresses the heart nor irritates the stomach and kidneys to the same extent as does the latter drug. It is excreted as urochloralic acid.

Occasionally, after the exhibition of large doses, it causes *slight poisoning*, the symptoms being chilliness followed by a sensation of heat, sweating, arrhythmia, nausea, and sometimes vomiting, with respiratory depression. These symptoms are rarely severe and usually pass off rapidly.

It is used as a *hypnotic* and *nervous sedative* in the same conditions for which chloral is prescribed, and is especially useful in *insomnia* due to nervous causes, but fails usually when *insomnia* is due to pain. It is also recommended in sea-sickness.

Dose gr. x–xxx (0.65–2.0) given in capsule or solution one hour before its effects are desired. It may be administered by the rectum.

CHLORALOSE.

What is chloralose?

Chloralose (not official) is formed by heating a mixture of anhydrous chloral and glucose.

It occurs as fine white crystals having an unpleasant, rather sharp taste, and being readily soluble in hot water and alcohol, but only slightly soluble in cold water.

While it appears to be a reliable hypnotic, it induces toxic symptoms readily, apparently by increasing the reflex excitability of the medulla oblongata, and would at present seem rather difficult to handle, as the toxic dose varies with different individuals, and is smaller in nervous and hysterical patients and in alcoholic subjects.

In sufficient doses general convulsions are produced, frequently accompanied by involuntary urination.

The toxic symptoms rapidly disappear on discontinuing the drug and appear to leave no serious consequences behind them. It has been *used* as a *hypnotic* and *analgesic.*

Dose gr. ij–iij or iv (0.13–0.2–0.25), always beginning with the smaller dose.

THE BROMIDES.

What are the physiological effects of the bromides?

The *bromides* are hypnotic and depressors of the reflex spinal centres. Applied *locally* to the pharynx, they diminish its reflex irritability. Given *internally* they cause drowsiness and often sleep by inducing a condition of cerebral anæmia, depress the reflex spinal centres and the functions of the end-organs of peripheral nerves, thus lessening nervous irritability, reflex activity and cutaneous sensibility. They also depress the functions of the sympathetic nervous system. In very large doses *potassium bromide* lessens the cardiac frequency and force, lowers the arterial tension (while contracting the blood vessels), and finally in animals paralyzes the heart in diastole. This seems to be due to the potassium only (which is a cardiac and nerve poison), for the other bromides do not arrest the cardiac action. They slow the respiration and lower the temperature of the body. They are eliminated by the kidneys, skin and mucous membrane.

What is bromism?

When taken for a long time they induce a condition known as *bromism*, the symptoms of which are acne, anæmia, drowsiness, defective memory, malaise, impaired reflexes, malnutrition, loss of sexual power and desire, and often a tendency to melancholia. These symptoms pass away when the drug is discontinued. No case of *acute poisoning* is on record.

What are the medicinal uses of the bromides?

They are used as *hypnotics* in all forms of *insomnia due to cerebral hyperæmia*, but are contraindicated when anæmia is present. In the early stages of *delirium tremens* they are of great service. They are also given as *depressor motors* in local or general convulsions as *chorea*, *uræmic*, *puerperal*, *hysterical* or *infantile convulsions*, *tetanus*, and as an *antidote* to *strychnine poisoning* (inferior to chloral). In the treatment of *epilepsy* they rank among the best remedies. In reflex vomiting, as of sea-sickness or pregnancy, they are of use. In *whooping cough* ammonium bromide is often efficacious. In *migraine* they are sometimes beneficial. For their *influence over the sexual functions* they are used to control *nymphomania*, *priapism*, and *masturbation*. Conjoined with ergot they are used to decrease the uterine blood supply in *menorrhagia*, and are of utility in *subinvolution of the uterus*. Strontium bromide is said markedly to diminish the amount of sugar in the urine in *glycosuria*.

What are the official bromides?

Potassii Bromidum (*potassium bromide*), dose gr. v–ʒj (0.32–4.0).

Ammonii Bromidum (*ammonium bromide*) has less influence on the circulation, respiration, and temperature than the potassium salt; dose gr. v–xxx (0.32–2.0).

Sodii Bromidum (*sodium bromide*), dose gr. v–ʒj (0.32–4.0).

Calcii Bromidum (*calcium bromide*), dose gr. v–ʒj (0.32–4.0).

Zinci Bromidum (*zinc bromide*), dose gr. j–x (0.065–0.648) (not much used).

Strontii Bromidum (*strontium bromide*), dose gr. iij–x (0.2–0.6).

Acidum Hydrobromicum Dilutum (*diluted hydrobromic acid*), containing 10 per cent. of the absolute acid, is said to possess similar effects to the bromides. It is chiefly used as a hypnotic, and added to quinine mixtures to prevent cinchonism. Dose fʒss–j (2.0–4.0).

What medicines are incompatible with the bromides?

Acids and the acidulous and metallic salts are chemically incompatible with the bromides. They are antagonized by cardiac and vaso-motor stimulants.

How may they be administered?

They may be given in powder or in solution in syrup. Zinc bromide may be used in pilular form. They are often given together in small doses, and to enhance their hypnotic effect may be combined with opium or its alkaloids, chloral or cannabis indica.

HYOSCINÆ HYDROBROMAS.

What is hyoscine hydrobromate?

Hyoscine is one of the alkaloids found in Hyoscyamus niger, or henbane (*q. v.*). It is an efficient hypnotic when used hypodermically, and is employed in the form of *hydrobromate* in *acute mania*, *alcoholic delirium*, and *hysteria*. Dose gr. $\frac{1}{80}$ (0.0008) by the mouth, or hypodermically gr. $\frac{1}{120}$ (0.0005).

PARALDEHYDUM.

What is paraldehyd?

Paraldehyd is a colorless liquid with a disagreeable odor and taste, prepared by heating ethyl aldehyd with a mineral acid or with zinc chloride.

What are its physiological actions?

In medicinal doses paraldehyd produces sleep closely simulating natural sleep, without affecting the cardiac action. It depresses the reflex centres, especially those of the upper part of the cord, and in *toxic amounts* depresses and finally paralyzes the respiratory centre, diminishing the amount of carbonic acid exhaled, and lowering the body temperature. It has no anodyne virtues. It often irritates the mucous membranes, and cutaneous eruptions sometimes follow its use.

What are its medicinal uses and dose?

It may be given as a *hypnotic*, where sleeplessness is not induced by pain, as in *delirium tremens*, *hysteria*, etc. As a *reflex depressor* it has been employed in *epilepsy*, and in animals poisoned by strychnine has proved antidotal. It is given in doses of fʒj (4.0), and should be freely diluted.

SULPHONAL.

What is sulphonal?

Sulphonal or *dional* (not official) is a substance prepared synthetically and described chemically as diethylsulphon-dimethylmethane. It occurs as heavy, prismatic crystals, colorless, odorless, and nearly tasteless, and is soluble in 100 parts of cold water, but freely soluble in hot water and also in ether and alcohol.

What are its physiological and its toxic effects?

The physiological action of sulphonal is not thoroughly understood. It acts chiefly on the cerebral centres, depressing them and causing sleep. Sometimes, especially after large doses have been taken, it depresses the reflexes, disorders digestion, and causes cutaneous eruptions. In large doses it depresses respiration, rendering it slow, weak, and, when excessive doses have been taken, stertorous, and finally producing death by cessation of the respiratory act.

It has but little effect on the circulation, and experimenters differ as to its effect upon the blood, the majority believing that it causes no change in that fluid which can be detected by chemical or spectroscopic analysis.

It is probably eliminated in great part by the urine, and frequently changes the color of that excretion to a reddish-brown—a change supposed to be due to the presence of hæmatoporphyrin, although the coloring-matter differs from the latter on spectroscopic analysis.

Disagreeable after-effects sometimes follow the use of sulphonal, as drowsiness, giddiness, headache, and occasionally incoördination of gait, sometimes cutaneous eruptions or disordered digestion, perhaps nausea and vomiting, occur.

Sulphonal is by no means an absolutely innocuous drug, and *death* has resulted from large doses in many recorded cases, from respiratory failure.

The symptoms of poisoning are various, the most common being drowsiness, stupor, muscular incoördination, mental and physical hebetude, depression of reflexes, nausea and vomiting, and usually constipation. Sometimes ataxic nervous symptoms, "diplopia, muscular tremor or paresis, ptosis, œdema of the eyelids, slow and weak (possibly stertorous) respiration, slow pulse, elevation of temperature, general anæsthesia, urine changed in color to reddish-brown, diminished in quantity or suppressed, aphasia, and cyanosis" (M. L. Foster).

In several cases with recovery which the author has seen the symptoms were drowsiness almost amounting to stupor; mental hebetude; slow speech; slight hallucinations; slow, shallow respiration; slow, weak pulse, and staggering gait with slight cyanosis. In non-fatal cases recovery is usually rapid. Sulphonal is *cumulative* in its action. During its administration it is of the utmost importance that the bowels should be made to act daily (Schulz) and that the urinary secretion should be abundant.

If symptoms of poisoning appear, the drug should at once be discontinued; the bowels should be freely opened, saline diuretics administered, and the patient kept in the recumbent position. If there is much depression of the circulation or respiration, stimulants may be administered.

What are its therapeutic uses?

Sulphonal is much used as a *hypnotic* and *cerebral sedative* in *nervous insomnia*, and even in *melancholia*, *delirium tremens*, and *acute mania*. In the *insomnia* of low fevers, as that of *typhoid fever*, it sometimes gives good results.

It has been recommended as a *sedative reflex depressant* in *asthma*, *hiccough*, *trismus neonatorum*, and in *convulsions due to dentition*, and has even been used in *epilepsy* and *chorea*. It is said that in small doses (gr. viij (0.5)) it is effective in arresting the *night-sweats* of *phthisis*, and that in *diabetes* it will temporarily diminish the amount of sugar excreted in the urine.

It is said to be *contraindicated* in *angina pectoris*. Dose gr. v–xxx (0.3–2.0), which may be given in capsules, but is better administered dissolved in hot water or milk, two hours at least before the time when its effects are desired.

As it is cumulative in its action, it is better not to give more than gr. xxx (2.0) in 24 hours.

TRIONAL.

What is trional?

Trional (not official) is a sulphone differing from sulphonal in that it contains one atom more of carbon and one less of hydrogen than the latter. Its chemical name is diethylsulphon-methylethylmethane.

It occurs as white, odorless, almost tasteless crystals, not very soluble in cold, but readily soluble in boiling water, and also in alcohol and milk.

What are its effects and uses?

Trional is a hypnotic, acting more quickly than sulphonal, being easily decomposed in the body, sometimes slightly lowering the pulse and blood-pressure, and rarely leaving any disagreeable after-effects. It is not cumulative. Occasionally after its long-continued use the urine is colored reddish-brown from the presence of hæmatoporphyrin.

Toxic doses given to animals cause death from respiratory paralysis.

Occasional *after-effects* are loss of appetite, epigastric pain, nausea and vomiting, vertigo, and unsteadiness of gait. These symptoms usually soon disappear.

It is supposed to act directly on the cerebral cortex.

Several cases of *acute poisoning* by trional have been reported; the symptoms being drowsiness, staggering gait, vertigo, vomiting, diarrhœa, loss of muscular power, and lowered temperature, sometimes attended with rapid pulse and respiration, excitement, and collapse.

Trional is *used* as a *hypnotic* in *insomnia* due to organic cerebral affections, neurasthenia, or other functional psychosis, worry or mental over-work.

As a sedative in cerebral excitement it is decidedly inferior to tetronal, and in sleeplessness due to pain it usually fails entirely.

It is a "safe and efficient hypnotic for children" when pain is not present (Claus).

It has also been recommended in *epilepsy*, either alone or combined with the bromides.

Dose xv–xxx (1.0–2.0) about half an hour before its effect is desired.

If it is administered for any length of time, it is better to intermit the dose occasionally, in order to guard against any possible cumulative effect, and it is important also to insure a daily evacuation of the bowels.

TETRONAL.

What is tetronal?

Tetronal (not official) belongs chemically to the disulphone group, to which also sulphonal and trional belong. It is diethylsulphondiethylmethane. These three products differ from each other chemically only in the number of molecules of ethyl and methyl which they contain. Thus *sulphonal* contains *two* molecules each of ethyl and of methyl, and is sometimes spoken of as dional; *trional* contains *three* molecules of ethyl and one of methyl, and *tetronal* contains *four* molecules of ethyl and none of methyl.

Tetronal is formed synthetically, and occurs in colorless, shining plates, without odor or taste, soluble in about 500 parts of cold, more soluble in hot water; soluble also in alcohol and in ether.

What are its effects and uses?

Its *effects* and *uses* are similar to those of trional, but it has a more decided sedative effect. Occasionally its administration is followed by disagreeable after-effects, as headache, anorexia, nausea, vomiting, vertigo, and even incoördination.

It is not decomposed in the system, and is excreted under its own form in the urine.

Dose gr. v–xv (0.3–1.0), repeated in an hour if necessary. The best vehicle for its administration is hot milk.

When given for a length of time it is better to intermit its use every 3d or 4th night.

URETHAN.

What are the effects and uses of urethan?

Urethan (not official) or ethyl carbamate is a synthetical product formed by the interaction of ethyl carbonate and ammonia, or by that of urea nitrate and ethyl alcohol, and occurs in crystalline masses readily soluble in water and alcohol. *In medicinal doses* it causes tranquil sleep, preceded by a short period of excitement. It depresses the reflex centres, at first quickens but soon slows the respiration, and somewhat reduces the temperature, and in overdoses causes, in animals, death from respiratory paralysis. The effect upon the heart is disputed. It is not analgesic. It has been *used* as a *hypnotic* in simple insomnia with varied success, and appears to be more applicable to cases where the action of chloral on the heart contraindicates the use of that agent. As a *motor depressant* it has been employed in *tetanus*, *infantile convulsions*, and *puerperal eclampsia*. Dose gr. ij–xxx (0.130–2.0). It has been used locally as an antiseptic dressing for wounds.

CANNABIS INDICA—INDIAN CANNABIS.

What is this drug?

Cannabis Indica is the *flowering tops* of the female plant of C. sativa or hemp (*Nat. Ord.* Urticaceæ), grown in the East Indies.

What are the active chemical constituents of hemp?

The alcoholic extract contains a *resin* (cannabin) and a volatile oil. It is claimed that several alkaloids have been discovered, but their existence is, as yet, doubtful.

What are the physiological actions of cannabis?

In full *medicinal doses* it at first stimulates and then depresses the cerebro-spinal functions without affecting respiration or circulation to any marked extent. The mental exhilaration is usually of a pleasurable kind, the pupils are dilated, ideas flow rapidly and conception of time and space are so altered that seconds seem hours and objects a few feet off seem miles away; an active, busy delirium usually occurs and sometimes increase of the sexual appetite; this is followed by a sense of weight in the extremities, depression of the reflexes, some loss of muscular power and cutaneous anæsthesia, succeeded by sleep. It increases but does not originate uterine contractions. No fatal case from its use is recorded.

What are its therapeutic uses?

It is used as a *hypnotic* in *mania* and in *mania-a-potu*; as an *anodyne* in *neuralgia*, *migraine*, *dysmenorrhœa*, *rheumatism*, and *gout*, and to relieve pain in *acute* and *chronic Bright's disease;* as an *antispasmodic* in *tetanus*, *chorea*, *hysteria*, and *spasm* of the neck of the bladder; as an *addition to cough medicines* to allay irritation of the throat, and to promote a condition of euthanasia in the later stages of phthisis. It is highly recommended in *dysentery*, and is of undoubted service in checking *uterine hemorrhages* not due to abortion or following labor. In *sexual impotence*, when functional, it is sometimes of use. In *gonorrhœa* it is said to lessen the discharge and prevent chordee. As a *local application* it enters into the composition of many *corn-cures.*

What are its preparations and doses?

Extractum Cannabis Indicæ (*extract of cannabis Indica*), dose gr. ¼–j (0.016–0.065).

Extractum Cannabis Indicæ Fluidum (*fluid extract of cannabis Indica*), dose ♏j–x (0.06–0.6).

Tinctura Cannabis Indicæ (*tincture of cannabis Indica*), dose ♏xxx (2.0). In using a new sample of cannabis Indica always begin with the minimum dose, as different samples vary much in strength.

HUMULUS.

What are the effects, uses, preparations, and doses of humulus?

Humulus is the *strobiles* of H. lupulus or hop vine (*Nat. Ord.* Urticaceæ). *Lupulin* is a yellow powder found near the base of the strobiles. It contains a volatile oil, *choline* (formerly called lupuline, a strongly alkaline liquid), *lupamaric acid* (a bitter principle), resin, etc.

Hops are tonic, very feebly narcotic, anaphrodisiac, and diuretic. They are used as a *hypnotic* in mild forms of *delirium tremens*, and in *restlessness* and *sleeplessness* from overwork; as an *anaphrodisiac* in *priapism*, *chordee*, *nymphomania*, and *satyriasis;* as an *antispasmodic* and *sedative* in *hysteria* and *neurasthenia;* as a *diuretic* and *anodyne* in *irritation of the bladder*, and locally as an anodyne poultice, and as a sedative injection in acute vaginitis.

Hop pillows are a popular remedy for sleeplessness due to nervousness.

Tinctura Humuli (*tincture of humulus*), dose f℥j–iv (4.0–15.0) or more.

Lupulinum (*lupulin*), dose gr. v–x (0.324–0.648), but not much used in this form.

Extractum Lupulini Fluidum (*fluid extract of lupulin*), dose f℥ss–ij (2.0–8.0).

Oleoresina Lupulini (*oleoresin of lupulin*), dose ♏x–xxx (0.61–2.0).

LACTUCARIUM.

What are the effects, uses, and preparations of lactucarium?

Lactucarium is the *concrete milk-juice* of Lactuca verosa, the garden lettuce (*Nat. Ord.* Compositæ), and contains *lactucin*, which is said to be even more feebly hypnotic than the crude drug. Lactucarium is supposed to possess *anodyne* and *hypnotic* powers, and has been used as a substitute for opium when the latter is indicated, but cannot, for any reason, be given. Its action, if any, is very mild.

Tinctura Lactucarii (*tincture of lactucarium*), dose ♏x–f℥j (0.6–3.6).

Syrupus Lactucarii (*syrup of lactucarium*), dose f℥ij–iv (8.0–15.0).

ORDER II.—MYDRIATIC ANODYNES.

What are the mydriatic anodynes?

The *mydriatic anodynes* are remedies employed as analgesics and antispasmodics, which possess no hypnotic effect, but cause dilatation of the pupil and, in large doses, a restless delirium.

What medicines are included under this head?

Belladonna, stramonium, hyoscyamus, duboisa, coca, and their alkaloids, and antipyrine.

BELLADONNA.

What is belladonna?

Belladonna is the *leaves* and *root* of Atropa Belladonna or deadly nightshade (*Nat. Ord.* Solanaceæ), a European plant, cultivated in this country.

What are the chemical constituents of belladonna?

Its properties depend upon an alkaloid called *atropine*, which exists in the plant as a malate. Both the leaves and the root also contain *belladonine* (probably oxyatropine), *hyoscyamine* (sometimes the predominating alkaloid in the leaves and often the only alkaloid in young roots), and *atropamine.*

What are the tests for atropine?

A delicate test is the addition of hydrobromic acid, which produces a yellow, amorphous precipitate, soon becoming crystalline. The *physiological test* (viz., the dilatation of the pupil in the lower animals after the local application of the suspected solution) should always be resorted to.

What are the physiological effects of belladonna and its alkaloid?

Applied *locally* to the skin, it is absorbed, lessens the sensibility of the sensory nerves, and produces constitutional effects. *Small doses, administered internally*, cause dryness of the mouth and throat, with some headache; after *larger amounts*, there is difficulty in swallowing, from arrest of the mucous and salivary secretions, the pupils dilate widely, the skin becomes dry and a scarlatinoid rash appears, the cardiac action is accelerated, and an active delirium occurs. In *moderate doses*, they act as *cerebral excitants; larger* *doses* produce hallucinations and impair the excitability of the motor and sensory nerves, thus producing a peculiar delirium in which there is a great desire for constant motion associated with lassitude. The *spinal reflex centres* are first stimulated, afterward paralyzed, if the amount taken be sufficiently large. It paralyzes the 3d nerves and stimulates the end organs of the sympathetic, thus dilating the *pupil* whether used locally or internally; the power of accommodation is also paralyzed, and after large doses the intraocular tension is lessened.

The *cardiac action* is at first slowed, if the dose be small (from stimulation of the inhibitory centre), but is soon much quickened (from progressive paralysis of the peripheral filaments of the vagus and stimulation of the cardio-accelerator centres or nerves). Large doses paralyze the cardiac muscle. Atropine stimulates the vasomotor centres and raises the arterial pressure, but after toxic doses the arterioles dilate, from paralysis of their muscular walls, and the blood pressure falls. It first stimulates and then paralyzes the respiratory centre. The *temperature* rises after moderate doses, probably from stimulation of the thermo-genetic spinal centres; but after toxic amounts have been taken a decided fall of temperature occurs, probably from vaso-motor paralysis. Small doses probably increase *intestinal peristalsis*, by depressing the inhibitory fibres of the splanchnics, while large doses paralyze the non-striated muscular fibres of the intestines and bladder. It arrests the *secretions* of the skin, mammary, salivary and muciparous glands, and probably of the liver and pancreas, by paralyzing the terminal filaments of the secretory nerves. The intestinal secretions are probably increased, as is that of the kidneys (usually). After large doses, the urine may be entirely suppressed.

Atropine is eliminated principally by the kidneys.

What are the symptoms and treatment of atropine poisoning?

The pupils dilate so widely that the iris can scarcely be seen; swallowing is impossible, from dryness of the throat and mouth; the muscular system is relaxed; maniacal delirium occurs, with impaired sensation, failing pulse, quickened followed by failing respiration, stupor, coma, sometimes convulsions, diminished body heat, and death usually from asphyxia. The *treatment* consists of: (1)

evacuation of the contents of the *stomach* (by emetics or stomach pump), *bowels* (by cathartics) and *bladder* (by the catheter), to prevent further absorption of the poison; (2) *giving tannic acid* freely as a chemical antidote; (3) *giving pilocarpine, physostigmine* or *morphine* hypodermically, as partial physiological antagonists, and (4) maintaining the circulation and respiration by electricity and artificial respiration.

What are the medicinal uses of belladonna and atropine?

As an *anodyne* in the various *neuralgiæ*, either locally or given by the mouth, rectum or subcutaneously, it is of value, and is often combined with morphine. In *muscular rheumatism* and in *myalgia* it is also of service. In *conjunctivitis* and in *iritis* it is used locally, not only to dilate the pupil but to lessen pain.

As an *antispasmodic* it is used to relax spasm and allay pain in *lead colic, spasmodic dysmenorrhœa*, and *cramps* of the bowel, bladder and urethra; also to relax the *rigid cervix uteri* in labor. In *asthma*, in *laryngysmus stridulus* and *whooping cough* it often proves of use. In *habitual constipation*, a small amount combined with purgatives increases their action by relaxing spasm of the intestinal muscular layer and stimulating peristalsis. It is a valuable remedy in the treatment of *incontinence of urine in children* when given in doses sufficient to produce some constitutional effect.

As a *cardiac and vaso-motor stimulant* in all cases of threatened collapse from *heart failure* it is advantageously employed, and has been highly recommended to contract the blood-vessels in *acute inflammatory affections* generally. *To check excessive secretion*, as in *salivation, excessive sweating*, especially the *night-sweats of phthisis*, and in *colliquative diarrhœa*, it is of great value, and is a well-known *galactafuge*, being used internally and applied locally for this purpose. As a *respiratory stimulant* in *opium poisoning* atropine is of great service, and may be used in cases of poisoning by other substances attended with failure of respiration.

Locally, belladonna is used as an ointment, liniment or plaster for the relief of pain in *neuralgia, myalgia* and *muscular rheumatism*; to *allay cardiac palpitation*; to *relax spasmodic stricture* of the urethra (applied on a bougie or given by suppository), and as a *galactafuge*. In *ophthalmic practice* a solution of atropine (gr. $\frac{1}{20}$–iv

(0.003–0.25) to water f℥j (4.0)) may be dropped into the conjunctival sac to *dilate the pupil* and to *paralyze accommodation*, so that an examination can be readily performed or the refraction of the eye determined. In various inflammations of the ocular apparatus, as conjunctivitis, keratitis, iritis, etc., it is used to lessen pain and diminish the blood-supply to the inflamed parts.

What are the preparations and doses of belladonna?

EXTRACTUM BELLADONNÆ FOLIORUM ALCOHOLICUM (alcoholic extract of belladonna leaves), dose gr. $\frac{1}{8}$–ss (0.008–0.032) in pill or suppository.

EXTRACTUM BELLADONNÆ RADICIS FLUIDUM (fluid extract of belladonna root), dose ♏j–ij (0.061–0.12).

TINCTURA BELLADONNÆ (*tincture of belladonna*), dose ♏v–xxx (0.3–2.0).

LINIMENTUM BELLADONNÆ (*liniment of belladonna*) contains 95 per cent. of the fluid extract and 5 per cent. of camphor.

UNGUENTUM BELLADONNÆ (*ointment of belladonna*) contains 10 per cent. of fluid extract.

EMPLASTRUM BELLADONNÆ (*plaster of belladonna*).

ATROPINA (*atropine*), usually employed in the more soluble form of ATROPINÆ SULPHAS (*atropine sulphate*), dose gr. $\frac{1}{120}$–$\frac{1}{60}$ (0.0005–0.001).

What substances are incompatible with belladonna?

Alkalies precipitate atropine from solutions of belladonna, and tannic acid forms with it atropine tannate, a less soluble salt.

What is homatropine hydrobromate?

It is a non-official salt of an alkaloid derived artificially from atropine. *It differs from atropine* in dilating the pupil more rapidly and much more transiently, in not causing much constitutional disturbance when used locally for this purpose, and in slowing, not accelerating, the heart's action. *It is used* as a substitute for atropine in ocular therapeutics.

STRAMONIUM.

What are the source, composition, action and uses of stramonium?

Stramonium is the *leaves* and *seeds* of Datura Stramonium, thorn-apple, Jamestown weed or gypsum (*Nat. Ord.* Solanaceæ), a common indigenous plant. It *contains* an alkaloid called *daturine*, isomeric with atropine and having the same action. As this is the active principle of stramonium, the *effects* of the latter are identical with those of belladonna, and it may be *used* for the same purposes. The leaves have been made into cigarettes and smoked to avert a threatened paroxysm of *asthma*, and it has been used externally as a poultice or as ointment to *painful wounds*, *external inflammations*, *hemorrhoids* and *fissure of the anus*. The *officinal preparations* (all made from the seed) are :—

EXTRACTUM STRAMONII SEMINIS (*extract of stramonium seed*), dose gr. ss (0.03).

EXTRACTUM STRAMONII SEMINIS FLUIDUM (*fluid extract of stramonium seed*), dose ♏j–v (0.06–0.3).

TINCTURA STRAMONII SEMINIS (*tincture of stramonium seed*), dose ♏v–xv (0.3–1.0).

UNGUENTUM STRAMONII (*ointment of stramonium*) contains 10 per cent. of the extract.

HYOSCYAMUS.

What is hyoscyamus?

Hyoscyamus is the *leaves* and *flowering tops* of H. niger, or henbane (*Nat. Ord.* Solanaceæ), a native of Europe.

What does it contain?

It contains two alkaloids, *hyoscyamine* and *hyoscine* (identical with scopolamine) both of which are isomers of atropine and daturine.

What are the physiological effects of hyoscyamus and its alkaloids?

Hyoscyamine appears to be identical in action to its isomer atropine, but feebler and less irritant. It does not dilate the pupil as rapidly; sometimes retards, sometimes quickens the heart's action; and at first quickens, then slows the respiration.

Hyoscine causes dryness of the mouth and throat, flushing of the face, sleep, slow respiration, and in large doses slow, full pulse, muscular weakness, incoördination, diaphoresis, and, it is said, a rise in temperature. The treatment of poisoning by hyoscine consists in the administration of alcoholic stimulants and coffee or caffeine; in artificial respiration; in the use of faradism, and perhaps the cautious use of physostigmine.

Hyoscyamus combines the action of its alkaloids, differing from that of belladonna in proving hypnotic.

What are the uses of hyoscyamus and its alkaloids?

Hyoscyamus has been used as a substitute for belladonna in the diseases in which the latter is employed. It has also been used as a *hypnotic* in various forms of *insanity*, in *delirium tremens*, and in *hysteria*. Added to *purgatives* it enhances their efficacy and prevents griping.

Hyoscyamine has been found useful as a *sedative* to the nervous system in *insanity;* to lessen spasm and allay pain in *vesical tenesmus*, and in *irritable bladder;* and, to prevent *griping*, as an addition to purgatives. It has sometimes proved useful in *chorea*.

Hyoscine is used as a *cerebral sedative* and *hypnotic* in maniacal excitement, but should only be employed temporarily, and then only in cases where *excitement* is a prominent symptom. In melancholia it has proved useless or injurious. Cases do not do well under its continued use. It may be employed to produce sleep when morphine or chloral is contraindicated in advanced renal disease and in cases of weak heart. To produce hypnotic effects it should be administered hypodermically. It has been found efficacious in *paralysis agitans* and in various forms of tremor. Disagreeable after-effects are rare.

What are the preparations and doses of these substances?

EXTRACTUM HYOSCYAMI (*extract of hyoscyamus*), a preparation of uncertain strength; dose gr. j–ij (0.065–0.13).

EXTRACTUM HYOSCYAMI FLUIDUM(*fluid extract of hyoscyamus*), dose ♏v–x (0.3–0.6).

TINCTURA HYOSCYAMI (*tincture of hyoscyamus*), dose f℥ss–j (2.0–4.0).

HYOSCYAMINÆ SULPHAS (*hyoscyamine sulphate*), dose gr. $\frac{1}{100}$–

$\frac{1}{50}$ (0.0006-0.0013) to begin with; much larger doses may be given with impunity.

Hyoscyaminæ Hydrobromas (*hyoscyamine hydrobromate*), dose gr. $\frac{1}{100}$–$\frac{1}{50}$ (0.0006–0.0013).

Hyoscinæ Hydrobromas (*hyoscine hydrobromate*), dose gr. $\frac{1}{100}$–$\frac{1}{80}$ (0.0006–0.0008); if given hypodermically, dose gr. $\frac{1}{150}$–$\frac{1}{100}$ (0.0001–0.00064) to begin with, but much larger doses may be used.

DUBOISIA.

What is duboisia?

Duboisia (not official) is the *leaves* of D. myoporoides (*Nat. Ord.* Solanaceæ), a shrub of Australia. It *contains* an alkaloid, called *duboisine*, which is isomeric with atropine. *Locally* applied to the conjunctival sac it paralyzes accommodation and dilates the pupil more rapidly but for a shorter time than does atropine, and is less irritating. Given *internally* it dilates the pupil, stimulates the respiratory centre, and depresses the inhibitory cardiac ganglia, thus causing increase in frequency both of the respiration and cardiac action. It is *used* as a substitute for atropine in ophthalmic practice.

COCA.

What is coca?

Coca is the *leaves* of Erythroxylon Coca (*Nat. Ord.* Lineæ), a shrub of Peru.

What does it contain?

It contains an alkaloid called *cocaine* combined with *cocatannic* acid.

What are the physiological effects of erythroxylon?

Coca is a cerebral stimulant, producing a sense of calm and well-being, followed, if the dose is large, by a pleasant delirium. It lessens the sense of fatigue and of hunger, but does not take the place of food. Small doses appear to slow, while large quicken the pulse and cause an elevation of temperature. It diminishes the amount of urea excreted. Large doses cause, also, muscular weakness, drowsiness, and finally deep sleep. When taken *in large doses habitually* it causes disordered digestion, enfeeblement of the intellectual powers, emaciation, ascites, and death from marasmus.

Cocaine produces similar effects. It is a *cerebral* stimulant, causing delirium in large doses followed by epileptiform convulsions and coma if the dose has been excessive. It first stimulates, then depresses the *reflex spinal centres.* Toxic doses depress and finally paralyze the *nerves*, these effects being more marked on the nerves of sensation. The effect on the *circulation* is disputed, but in small doses it increases the strength and frequency of the cardiac contractions. It acts as a powerful stimulant upon the *respiratory* centre, but in large doses paralyzes it, the heart continuing to beat after the breathing has stopped. *Injected hypodermically* into the superficial tissues it causes local anæsthesia; if a deep injection is given a slight general lessening of sensibility, dilated pupils, a slight rise in temperature with strong cardiac contractions result.

Locally applied it causes marked anæsthesia of the surface with which it comes in contact, with some diminution of sensibility of the deeper structures. There is at first local pallor from contraction of vessels, followed by redness. Applied to the conjunctiva it dilates the pupil (which may, however, be contracted by eserine) transiently, lessens without entirely suspending the power of accommodation, and lowers ocular tension.

In *toxic doses* cocaine causes symptoms varying much in different persons. The most common symptoms are stimulation of the mental faculties; loquacity; incoherence; depression of temperature accompanied by profuse sweating; shallow, irregular respiration; feeble pulse; dilated pupils and disturbed vision; nausea and collapse. Sometimes there is intellectual torpor with tonic or clonic convulsions. Sometimes the mental excitement is almost maniacal.

Respiratory disturbances are always marked, in severe cases being of the Cheyne-Stokes type, and the sufferer may die from respiratory paralysis.

Individual susceptibility to the drug varies greatly, and even persons who have used it before without inconvenience may experience a toxic effect from a dose of the same size as that which they had before taken. Even weak solutions applied to a mucous membrane occasionally produce alarming symptoms.

The *treatment of poisoning* by cocaine consists in inhalations of amyl nitrite and chloroform; ammonia should be given internally, and artificial respiration resorted to and continued for a long time.

Opium, or morphine, and chloral may be used if convulsions occur.

What are the medicinal uses of coca and its alkaloid?

Coca is not much employed in medicine. It may be given as a stomachic *tonic* in wasting diseases, as in *phthisis.*

Cocaine is principally used as a *local anæsthetic* (2 to 10 per cent. solution), in operations on the various mucous membranes, particularly those of the eye, nose, mouth, pharynx and larynx, but also to those of the vagina, rectum and urethra. Injected into the superficial tissues it diminishes sensation sufficiently to allow of the performance of many operations in minor surgery, particularly if its diffusion is prevented by compressing the circulation of the part. In ophthalmology it is useful both for this purpose and from its rapid and transient mydriatic effect.

To *relieve pain* and *contract the blood vessels* in the early stages of acute catarrhal inflammations, as *coryza*, *hay fever*, *laryngitis* and *bronchitis ;* to deaden sensation and thus *lessen reflex cough* in *pertussis*, *influenza*, advanced *phthisis* and *chronic laryngitis*, it may be used in spray, or directly applied to the part by a brush. It has also been used as a *hemostatic*, applied to the mucous membranes, especially to the nasal mucous membrane, previous to an operation. It is highly recommended to allay the burning and itching of rhus poisoning. *Internally* it has been employed in *gastrodynia*, *nervous dyspepsia*, and to check *reflex vomiting*, as that of pregnancy or of sea-sickness (by the mouth or injected into the epigastric region), as a cardiac tonic in low fevers, and as a substitute for morphine in persons accustomed to the habitual use of the latter alkaloid. When used for this purpose the cocaine habit is apt to be formed, but can apparently be broken off suddenly without danger to the patient.

What are the preparations and doses of coca?

EXTRACTUM COCÆ FLUIDUM (*fluid extract of erythroxylon*), dose f℥ss–ij (2.0–8.0).

COCAINÆ HYDROCHLORAS (*cocaine hydrochlorate*), dose gr. ¼–j (0.016–0.06).

ANTIPYRINE.

Is antipyrine a mydriatic anodyne?

Antipyrine and other members of the antipyretic group are anodynes of considerable power, as has already been stated, and in large doses dilate the pupil, but are not used as mydriatics.

ORDER III.—ANÆSTHETICS.

What are anæsthetics?

This name is applied to a group of medicines, the vapor of which when inhaled causes a temporary loss of sensibility to painful impressions (*analgesia*), with diminution and finally abolition of general sensation and reflex action, and lastly, complete loss of consciousness.

Name the agents of this group.

Ether, chloroform, nitrous oxide, methylene bichloride, ethyl bromide and bromoform.

ÆTHER—ETHER.

What is ether?

Ether is ethyl oxide, obtained by the distillation of alcohol with sulphuric acid. It is a colorless liquid, with a strong, disagreeable odor, and a hot, burning taste, and evaporates rapidly at ordinary temperatures. Its vapor is heavy—more than two and a half times as heavy as the atmosphere—and is very inflammable.

What are its physiological effects?

When applied *locally* ether produces a feeling of coldness by its rapid evaporation, thus obtunding the sensibility of the part, and if the application be continued the part may be entirely frozen.

When the vapor of ether is *inhaled* a sense of burning is experienced in the throat, followed by a feeling of suffocation and an irritative cough; then comes a *stage of stimulation*, during which the action of the higher nerve centres is more or less interfered with, there is a feeling of lightness in the head and buzzing in the ears, and the circulation is quickened; this passes into the *narcotic stage*, the patient becoming delirious and laughing, weeping, moaning, talking, singing or fighting. The face is suffused, the eyeballs injected and often protruding, the veins turgid, sensibility is diminished, and tonic contractions of the muscles are often present. If the inhalation is continued the *stage of anæsthesia* soon supervenes, in which the functions of the spinal cord are influenced; thus, there is not only complete insensibility, but also entire abolition of the reflexes. This stage may be continued indefinitely by carefully regulating the inhalation. If, however, too much be given, the *stage of paralysis* ensues, in which the reflex centres of the medulla oblongata are paralyzed and the respiration and circulation cease. Stertorous respiration, from paralysis of the muscles of the palate, is the first indication of the approach of this stage.

During the inhalation of ether the pupils at first contract slightly, afterward slightly dilate, but always respond to light. Sudden, wide dilatation is a sign of danger.

The pulse is increased in frequency during the early stages of ether inhalation, afterward returning gradually to about the normal. The arterial pressure is increased, due principally to contraction of the peripheral capillary vessels and to the increased power of the cardiac beat. During the stage of paralysis the pressure falls when respiratory failure begins.

In the first stage the respiration is increased both in frequency and depth, becoming much more shallow in the second stage, but again becoming deep and even stertorous in the third stage, and finally ceasing if the etherization be continued into the fourth stage from paralysis of the respiratory centre, the heart continuing to pulsate after the arrest of the respiratory movement.

The *after-effects* are headache, vomiting, and a taste of ether in the mouth. Some hours elapse after profound anæsthesia before the patient fully regains the use of his mental faculties.

Taken *internally* ether increases the secretions and is a cerebral and cardiac stimulant, being similar in its action to alcohol.

It is rapidly *eliminated* by the lungs.

What are the therapeutical uses of ether?

1. As an *anæsthetic*, ether is employed by inhalation for the prevention of pain during *surgical operations* and examinations, and during the passage of *renal* or *biliary calculi*. For these purposes the inhalation should be carried to the third stage—that of complete anæsthesia. To alleviate suffering during labor ether is often ad-

ministered, but here it should only be inhaled during the pains, and the stage of complete anæsthesia is rarely required, unless some obstetric manipulations, as version, the application of the forceps, or craniotomy is necessary, or when it is desirable to prevent the patient from "bearing down," either from fear of laceration of the soft parts, or of the strain on the circulation in cardiac disease, or where thorough relaxation of a rigid cervix uteri is desired. 2. As a *reflex depressant* it is inhaled in various forms of *convulsions* during the paroxysms, and to promote the reduction of a hernia, or aid in diagnostic manipulations by relaxing tensely contracted muscles. In persistent hiccough it is sometimes successful when given internally, or may be used by inhalation to check the paroxysm. 3. As a *cardiac stimulant* it may be given hypodermically or by the mouth in cases of syncope or threatened cardiac failure. 4. It is sometimes used as a *tæniacide*; and, 5. it has sometimes proved useful as an *anodyne* in *neuralgia* (injected in the vicinity of the nerve), and in *nervous headache* (given internally). 6. *Locally* it is employed to relieve pain in neuralgia, myalgia, muscular rheumatism and before the performance of minor surgical operations.

What cautions should be observed in administering ether?

As ether is highly inflammable, it should not be administered by inhalation at night near a candle or gas light, nor near an open fire or very hot stove. If a light is in the room it should be placed as high as possible above the patient, as the vapor of ether sinks toward the floor. Ether is contraindicated in advanced pulmonary disease, and should be cautiously administered, if at all, in cases of cerebral tumors, grave renal disease and excessive exhaustion of the nerve centres.

In cardiac diseases it is the safest anæsthetic and may be cautiously employed.

How should alarming symptoms be treated?

(1) Stop the inhalation and lower the head; (2) dash cold water on the face and chest and allow the patient plenty of fresh air; (3) use artificial respiration, make rhythmic tractions of the tongue at the rate of about 20 per minute, give atropine, strychnine, or nitroglycerin hypodermically; and (4) apply the faradaic current to the thoracic muscles.

What are the official preparations of ether and how are they administered?

Æther (*ether—œther fortior*, U. S. P. 1880) contains about 96 per cent. by weight of absolute ether or ethyl oxide in alcohol and water; dose ♏v–fʒj (0.31–3.70).

Spiritus Ætheris (*spirit of ether*) contains 32.5 per cent. of ether in alcohol; dose ♏xv–fʒj (0.92–3.70).

When ether is *administered by inhalation* the patient should be, if possible, in the recumbent position, and, the nose and throat having been sprayed with a 10 per cent. solution of cocaine (Rosenberg of Berlin), f℥ss (15.0) may be poured on a napkin or sponge placed in a cone of stiff paper, which is then applied to the patient's mouth and nose, and kept there continuously, only removing it momentarily from time in time to add more ether, until the desired effect is produced.

The anæsthetizer should pay the strictest attention to the condition of his patient, watching closely the effect on the respiration and on the circulation as shown by the pulse and by the color of the skin or conjunctival mucous membrane.

Ether inhalations are better administered on an empty stomach, as the after-effects, especially the tendency to vomiting, are thus lessened.

Spraying the nose and throat with cocaine, as mentioned above, is said to increase the safety of the patient during the anæsthesia, and certainly prevents the coughing, gagging, and vomiting which otherwise usually accompany the action of the anæsthetic, and lessens the vomiting, headache, and persistent taste of ether which so often follow its use.

CHLOROFORMUM—CHLOROFORM.

What is chloroform?

Chloroform is methenyl chloride or formyl terchloride, and is obtained by distilling alcohol with chlorinated lime and slaked lime.

It is a limpid, colorless liquid, having a pleasant ethereal odor and an acrid, sweetish taste.

It is soluble in alcohol and the oils, but is not very soluble in water.

What are its physiological effects?

Applied *locally* it is to some extent anæsthetic; if evaporation be prevented it is an irritant and even a painful vesicant. It assists the absorption of organic alkaloids by the skin, which otherwise would not penetrate the epidermis. When the vapor of chloroform is *inhaled* anæsthesia and unconsciousness rapidly result.

The *stage of stimulation* is not as well marked as in the case of ether inhalation; the *narcotic stage* is usually short in duration and the struggles of the patient are, as a rule, not violent. The pulse is quickened and apparently strengthened until the *stage of anæsthesia*, when with the abolition of consciousness and sensation and muscular relaxation it diminishes slightly in frequency and is more or less weak. The *stage of paralysis* is one of imminent danger. In addition to the symptoms of the anæsthetic stage, there is stertorous breathing, entire abolition of the reflexes, with a weak and rapid pulse, and finally death, usually from cardiac paralysis.* When *swallowed* in small doses it stimulates the secretions and increases peristalsis. In large amounts it is an irritant, causing gastro-enteritis, and after its absorption producing anæsthesia and coma. It is eliminated by the lungs and kidneys.

How do the physiological actions of ether and chloroform compare?

Ether is the safer anæsthetic; chloroform the more rapid, more transient in its effects, which are produced by smaller amounts, pleasanter, less irritating, and with less disagreeable after-effects. It does not cause so much vomiting, and its vapor is not inflammable. Death from ether (rare) is usually the result of respiratory paralysis and is gradual, while death from chloroform (much more frequent) is usually sudden, and is due to cardiac failure.

What are the therapeutical uses of chloroform?

It has been used as an *anæsthetic* by inhalation in the same range of cases in which ether is given, but its employment for this purpose is now very generally limited to diseases like puerperal eclampsia, in which it is necessary rapidly to produce anæsthesia and depress reflex action. In *obstetric practice* it is largely used, but even here ether is safer. Administered *internally* it has proved serviceable in *cholera*, *protracted diarrhœa*, and various forms of *colic*. It has also been used as a *tæniacide*. Given before the expected chill of *malarial fevers* it frequently aborts the paroxysm. Deep *injections* in the vicinity of the affected nerve sometimes afford relief in obstinate neuralgia. *Locally* as an anodyne it is employed in the form of liniment in muscular pains and in neuralgic affections. Its *contraindications* as an anæsthetic are identical with those of ether, and in addition *it should never be administered when any disease of the circulatory system exists or if the heart is feeble from any cause whatsoever.*

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* The Hyderabad commission concluded, from their very elaborate experiments upon dogs, that death always occurs from respiratory paralysis, a conclusion which at present is not in accord with clinical observation. The author has therefore adhered to the older view as to the mode of death under chloroform.

How should the occurrence of dangerous symptoms be met?

Stop the inhalations; invert the patient; artificial respiration; faradization; and atropine, strychnine, or nitroglycerin hypodermically. If it has been administered internally, treat the case as one of irritant or narcotic poisoning.

What are the official preparations, and how may they be administered?

Chloroformum (*chloroform*), dose ♏xv–fʒj (1.0–4.0) in emulsion. As an *inhalation*, 20 drops of chloroform may be poured on a folded napkin and placed cautiously over the nose and mouth in such a manner that the vapor is freely diluted with atmospheric air *Not more than 3½ per cent. of chloroform should be contained in the air inspired.*

Aqua Chloroformi (*chloroform water*), dose fʒj–jv (4.0–15.0).

Spiritus Chloroformi (*spirit of chloroform*), dose fʒss–ij (2.0–8.0).

Emulsum Chloroformi (*emulsion of chloroform*), dose fʒj–ij (4.0–8.0).

Linimentum Chloroformi (*liniment of chloroform*) contains chloroform 30 per cent. in soap liniment.

NITROUS OXIDE.

What is nitrous oxide?

Nitrous oxide (not official) or nitrogen monoxide is a colorless, almost odorless gas, made by the action of heat on ammonium nitrate.

What are its physiological actions?

When nitrous oxide is inhaled in from one to three minutes complete anæsthesia occurs with loss of consciousness, often preceded by a stage of excitement; the face is livid and the patient presents the appearance of asphyxia. The anæsthesia is probably due to diminution in the relative amount of oxygen in the blood. When the inhalation is discontinued, consciousness and sensation speedily return, and as a rule no after-effects are manifested. When death results it is generally due to asphyxia.

What are the therapeutics and the mode of administration of nitrous oxide?

As an *anæsthetic* in minor surgical operations of short duration, as the extraction of teeth or the opening of abscesses, it is advantageously employed, but when the operation necessitates the maintenance of anæsthesia for some time, ether is a safer agent.

It is best *administered* from an india-rubber bag, connected with an iron reservoir, containing at least eight gallons, furnished with a mouth-piece having two valves, so that the expired air may not pass back into the bag.

METHYLENE BICHLORIDE: ETHYL BROMIDE: BROMOFORM.

What are these substances?

Methylene bichloride (not official) is a neutral, colorless liquid, resembling chloroform in odor. Its vapor is inflammable. When *inhaled* it rapidly produces anæsthesia and unconsciousness, and these effects as rapidly disappear when the inhalation is discontinued. Death is due to cardiac paralysis. It is not much employed in this country.

Ethyl bromide (not official) is a colorless, neutral liquid, having an ethereal odor and a disagreeable, sweetish taste. When inhaled it is anæsthetic, acting on the heart like chloroform, and seems to be fully as dangerous.

Bromoform (not official) is a heavy liquid with an agreeable taste and smell. Its effects resemble chloroform, but are slower. It is not much used as an anæsthetic. As an antispasmodic it has been used in *pertussis* in doses of gtt. ij–v (0.12–0.3) t. i. d.

LOCAL ANÆSTHETICS.

What are local anæsthetics?

They are remedies which produce an anæsthetic effect limited to the particular part to which they are applied.

What are the indications for their employment, and what are the objections to their use?

They are employed whenever it is necessary to obtund the pain in a part, either caused by disease or induced by a surgical operation, and when it is not necessary for any reason that the patient should lose consciousness.

They are generally made use of prior to minor surgical operations for the avoidance of pain, although they have also been employed for the same purpose before major operations, as amputations.

In such cases, however, it is often advantageous to have the patient unconscious, as the knowledge of what is being done, even in the absence of pain, may prove injurious by causing nervous perturbation or by allowing the patient to interfere with the operator.

They are objectionable in some cases on account of the anæmia which they produce, as during the reaction the resulting hyperæmia may be sufficiently intense to cause hemorrhage, or occasionally interfere with the healing process.

How is local anæsthesia produced?

Either by freezing the part which it is desired to anæsthetize, or by the application to, or injection into it of an anæsthetic drug.

How may a part be frozen for such a purpose, and what are the agents employed?

The part may be frozen by the direct application for a few minutes of a freezing mixture such as powdered ice and salt, or by spraying it with a very volatile liquid, such as rhigolene, ether, or ethyl chloride.

What are these substances, and how are they used?

RHIGOLENE (not official) is a very volatile and inflammable liquid obtained in the distillation of petroleum, and is used in the ordinary hand-atomizer.

ETHER has already been spoken of as a local anæsthetic.

ETHYL CHLORIDE (not official), or *hydrochloric ether*, is a very volatile liquid, which is sold in glass bottles having a minute orifice against which a tightly fitting stopper, moved by a small lever, is kept constantly pressed by means of elastic bands. When it is desired to use it the lever is pressed down, the orifice of the bottle passed rapidly over the part to be anæsthetized at a short distance from it, and the heat of the hand volatilizing the liquid in the bottle, the part is soon frozen by the spray.

These agents are *used* as local anæsthetics in all *minor surgical operations*, such as opening abscesses or felons, the extraction of ingrowing toenails, paracentesis thoracis or abdominis, and are sometimes used to *numb* the *pain* of headache and neuralgia.

What drugs are employed topically or by hypodermic injection for this purpose?

COCAINE (*vid. Mydriatic Anodynes*) is used locally as has already been mentioned, applied to the conjunctival, to the nasal, and to other mucous membranes as a local anæsthetic.

It is also used by injection into the skin for the same purpose. When this is desired the part is first sprayed with ethyl chloride, and as soon as sensibility is obtunded the needle of the hypodermic syringe is inserted and a few drops of the cocaine solution instilled just beneath the integument. By injecting the solution in front of the point of the needle, which is then pushed further into the anæsthetized area, and a few more drops inserted, it is possible gradually to anæsthetize quite a large surface. By casting a ligature around the part and thus preventing the cocaine from passing out by the blood current, this anæsthetic action may be prolonged.

By this or similar means local anæsthesia has been maintained for periods considerably over an hour, during which operative procedures of some magnitude have been performed. It is probably better, however, to employ general anæsthesia for major surgery unless there is some contraindication to its employment, and to restrict the anæsthetic use of cocaine to minor surgery.

EUCAINE (not official) has been highly recommended as a local anæsthetic. The hydrochloride is used, and occurs as brilliant colorless crystals, readily soluble in water (which is not the case with eucaine itself).

It is much more stable than cocaine, not even decomposing when kept in solution. Locally applied to mucous membranes in 2 to 5 per cent. solutions it causes anæsthesia, but it neither dilates the pupil nor causes ischæmia, as does cocaine, when applied to the conjunctiva. In fact, it appears to favor hyperæmia and does not interfere with the pupil reflex. It is said to produce a primary reduction in the cardiac frequency when given internally. In animals after large doses there is general nervous excitement followed by paralysis, sometimes preceded by tonic and clonic convulsions. The blood-pressure falls and finally death occurs from respiratory failure.

No toxic symptoms have been reported as occurring in the human subject.

It has been used as a substitute for cocaine to produce local anæsthesia, and may be employed in solutions of the strength of 2 to 5 per cent. It has also been injected subcutaneously in the same manner as cocaine prior to the opening of abscesses or the removal of small tumors. It is said that as much as gr. xxx (1.9) has been used subcutaneously for this purpose without ill effect.

MENTHOL (official) is a "*stearopten* (having the character of a secondary alcohol), *obtained from the official oil of peppermint* (from Mentha piperita), or from Japanese or Chinese oil of peppermint (from Mentha arvensis" "and Mentha canadensis," *Nat. Ord.* Labiatæ). It occurs in the form of colorless, acicular or prismatic crystals, having a strong and pure odor of peppermint, and a warm, aromatic taste, followed by a sensation of cold when air is drawn into the mouth, and being only slightly soluble in water, but freely so in alcohol, ether, and chloroform. Menthol is a superficial, local anæsthetic. Given internally to animals in sufficient doses it depresses both the sensory and motor nerves, lowers the temperature, and depresses the respiration, which becomes slow and shallow.

It is chiefly *used* as a *local anæsthetic* painted or sprayed on the part in ethereal or alcoholic solutions varying in strength from 10 to 50 per cent., in cases of neuralgia, toothache, and other superficial pains. The author has seen the burning pains which often follow herpes zoster quickly relieved and often permanently cured by a few applications of a 50 per cent. alcoholic solution. Urticaria and senile pruritus may be temporarily relieved by the application of a 10 per cent. solution in albolene. It is also used with lanolin as an ointment, and has been used as an antiphlogistic remedy in superficial inflammations of the skin and mucous membranes.

GUAIACOL (not official), which has been considered among the antipyretics (q. v.), is also used as a *local anæsthetic* in *neuralgiæ*, especially in *sciatica*, and in rheumatic pains.

Various other remedies, among which may be mentioned *Tincture of Aconite* (*vid. Cardiac Sedatives*), have been used locally in neuralgia for their local anæsthetic effect.

ORDER IV.—ANTISPASMODICS.

What are antispasmodics?

Antispasmodics are remedies which prevent or allay spasmodic action of voluntary or involuntary muscles by increasing the inhibiting power of the higher over the lower nerve centres.

Name the antispasmodics.

Musk, valerian, the valerianates, asafœtida, camphor, ethereal oil, and Hoffman's anodyne, cypripedium, and scutellaria.

MOSCHUS—MUSK.

What is musk?

Musk is the *dried secretion* from the preputial follicles of Moschus moschiferus, or musk deer.

What are its effects and uses?

Musk is a mild cerebral stimulant and antispasmodic, slightly increasing the cardiac frequency. In cases of nervous exhaustion, however, it acts more powerfully, and when a pure article can be obtained no better nervous stimulant can be employed in the later stages of *typhoid fever* with great depression of vital forces, and *in typhoid pneumonia*. It is also of use in *hysteria*, *hiccough*, and *chorea*.

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What are the preparations of musk?

Moschus (*musk*) is very expensive and is often adulterated, and imitations are not infrequently substituted for the genuine article; dose gr. x–xv (0.65–1.0) in capsule or emulsion. It is often given per rectum.

Tinctura Moschi (*tincture of musk*), dose f℥j–ij (4.0–8.0).

VALERIANA—VALERIAN.

What is valerian, and what does it contain?

Valerian is the *rhizome* and *roots* of V. officinalis or wild valerian (*Nat. Ord.* Valerianeæ). It contains a volatile oil and a colorless volatile acid (*valerianic*).

What are the effects and uses of valerian?

Large doses of valerian may cause nausea, vomiting, and sometimes colicky pains. It slightly stimulates the brain and circulation, and increases the secretions of the skin and kidneys. Its effects are more decided in nervous excitement due to depression of the cerebral functions, as in *hysteria* or "*nervousness*," and in *hypochondriasis*. It has also been used as a cerebral stimulant in the *delirium* of low fevers and in *delirium tremens*.

What are the preparations and doses of valerian?

Extractum Valerianæ Fluidum (*fluid extract of valerian*), dose f℥j (4.0).

Tinctura Valerianæ (*tincture of valerian*), dose f℥j (4.0).

Tinctura Valerianæ Ammoniata (*ammoniated tincture of valerian*), dose f℥j–ij (4.0–8.0).

Ammonii Valerianas (*ammonium valerianate*) is much used in *hysteria*, *neuralgia*, and *nervous headache;* dose gr. ij–x (0.13–0.65) in capsules or elixir.

Iron valerianate and *quinine valerianate* have already been considered; *zinc valerianate* will be noticed under the zinc preparations.

ASAFŒTIDA—ASAFETIDA.

What is asafetida, and of what is it composed?

Asafetida is a *gum-resin* obtained from the *root* of Ferula fœtida (*Nat. Ord.* Umbelliferæ), a native of Afghanistan. It is composed of a gum-resin united to a volatile oil.

What are its effects and uses?

It is a gastric stimulant and carminative, and produces a sense of exhilaration. It increases the mucous secretions and peristalsis, and in large doses quickens the pulse and respiration. Very large doses may cause nausea and vomiting.

It is *used* as an *antispasmodic* in *hysteria* and *nervous exhaustion;* as a *carminative* in *tympanites* (by the rectum); as a *stomachic tonic* in *dyspepsia* with flatulent colic, and as an *expectorant* in *chronic bronchitis* and in *whooping-cough*, where it also acts as an antispasmodic.

What are its preparations and doses?

Emulsum Asafœtidæ (*emulsion of asafetida—lac asfœtidæ*), dose f℥ss–j (15.0–31.0), or as an enema f℥ij–iv (62.0–124.0).

Pilulæ Asafœtidæ (*pills of asafetida*), each pill containing gr. iij (0.2) of asafetida; dose No. ij–iv.

Tinctura Asafœtidæ (*tincture of asafetida*) contains 20 per cent. of asafetida; dose fʒss–j (2.0–4.0).

Pilulæ Aloes et Asafœtidæ (*pills of aloes and asafetida*), each pill contains of aloes, asafetida and soap gr. j⅓ (0.09) each.

CAMPHORA—CAMPHOR.

What is camphor?

Camphor is a *stearopten*, derived from Cinnamomum Camphora, or camphor laurel (*Nat. Ord.* Laurineæ), an evergreen tree of China and Japan. It is obtained by boiling chips of the tree in water and skimming off the camphor as it rises to the surface. This *crude camphor* is afterward *refined* by sublimation with quicklime.

What are the physiological effects of camphor?

Locally camphor is an irritant. *Internally in moderate doses* it is to some extent an anodyne and a cerebral exhilarant, sometimes quickening the pulse and raising arterial tension, and occasionally proving aphrodisiac. In *large doses* (gr. xx (0.13)) it depresses the circulation, and produces lassitude and diaphoresis. It is also anaphrodisiac. In *toxic doses* (ʒss–j (2.0–4.0)) it causes faintness, vertigo, headache, delirium, violent epigastric pain, unconsciousness, and sometimes convulsions. No case is recorded to have proved *fatal in an adult.*

What are the medicinal uses of camphor?

It is employed as an *antispasmodic* in "*nervousness*," *nervous headaches*, *hysterical complaints*, *dysmenorrhœa*, "*after-pains*," simple *diarrhœa*, and combined with other remedies in *cholera*. It is also used in *low forms of fever*, to quiet delirium and sustain the system. As an *anaphrodisiac* to quiet abnormal sexual excitement in *chordee*, *nymphomania*, and *priapism*. *Externally* it is employed as a liniment in myalgia, muscular rheumatism, and sprains. Dissolved in oil of turpentine it forms an efficient liniment in mild bronchial affections.

What are its preparations and their uses?

CAMPHORA (*camphor*): dose gr. j–x (0.06–0.65), or even gr. xx (1.3) given in emulsion, or in pill or capsule. Not much used in this form.

AQUA CAMPHORÆ (*camphor-water*) contains 1 part of camphor in 125 parts of the preparation; dose f℥ss–ij (15.0–60.0). It is used chiefly as a vehicle or where a mild antispasmodic is needed.

SPIRITUS CAMPHORÆ (*spirit of camphor*) contains 10 per cent. of camphor. It is used as an embrocation, and is also given internally where a stronger preparation than the water is desired; dose ♏v–fʒj (0.3–4.0).

LINIMENTUM CAMPHORÆ (*camphor-liniment*) contains 20 per cent. of camphor in cottonseed oil.

CERATUM CAMPHORÆ (*camphor-cerate*) contains 1 per cent. of camphor-liniment.

LINIMENTUM SAPONIS (*soap-liniment*) is much used externally, either alone or combined with stronger liniments.

CAMPHORA MONOBROMATA (*monobromated camphor*); dose gr. v–x (0.32–0.65) in gelatin-coated pill or capsule. It is useful as an antispasmodic in *hysteria*, and as an anaphrodisiac in *chordee* and *priapism*.

Hope's Camphor Mixture (not official) consists of nitrous acid fʒj (4.0); laudanum ♏xij (0.74); camphor-water f℥viij (240.0). Dose, f℥ss (15.0) repeated as required. Much used in diarrhœa and dysentery.

OLEUM ÆTHEREUM—ETHEREAL OIL.

What is ethereal oil?

Ethereal oil, or oil of wine, is made by distilling alcohol with an excess of sulphuric acid and diluting with an equal volume of ether, and is a nearly colorless volatile liquid. It is antispasmodic, and in small doses a cardiac and vaso-motor stimulant, while in large doses it paralyzes the cardiac muscle and the vaso-motor nerves. It is only used medicinally as

SPIRITUS ÆTHERIS COMPOSITUS—COMPOUND SPIRIT OF ETHER.

What is this substance?

Compound spirit of ether, or *Hoffman's anodyne*, is a solution of ethereal oil (2.5) in ether (32.5) and alcohol (65.0), and is a good antispasmodic, circulatory stimulant and carminative, and is useful in the class of diseases to which antispasmodics are applicable, especially when a cardiac stimulant is required; dose fʒj–ij (4.0–8.0) repeated, and best administered in iced water.

CYPRIPEDIUM: SCUTELLARIA.

What are these remedies?

Cypripedium is the *rhizome* and *roots* of C. pubescens and of C. parviflorum (*Nat. Ord.* Orchideæ), indigenous plants, commonly called ladies' slipper and moccasin plant. *Scutellaria* is the *herb* S. laterifolia or skullcap (*Nat. Ord.* Labiatæ), an indigenous herb. They possess mild antispasmodic properties, and have been used as substitutes for valerian.

Extractum Cypripedii Fluidum (*fluid extract of cypripedium*), dose ♏x–xx (0.6–1.2).

Extractum Scutellariæ Fluidum (*fluid extract of scutellaria*), dose fʒj (4.0).

ORDER V.—Excito-Motors.

What are excito-motors?

Excito-motors are medicines which by stimulating the reflex centres of the spinal cord excite muscular action.

Name the excito-motors.

Nux vomica and its alkaloids; rhus toxicodendron and picrotoxin.

NUX VOMICA.

What is nux vomica?

Nux vomica is the *seed* of the Strychnos Nux-vomica or poison nut (*Nat. Ord.* Loganiaceæ), a tree of India.

What active principles does it contain?

It contains two alkaloids, *strychnine* and *brucine*, combined with *igasuric acid*, and according to some investigators, a third alkaloid, *igasurine*, has been discovered.

How may the presence of these alkaloids be detected?

Strychnine may be detected by the addition of a crystal of potassium bichromate to a solution of the alkaloid in concentrated sulphuric acid on a porcelain plate, when a deep, rich blue color passing through purple into red rapidly makes its appearance.

The *physiological test* is the production of tetanic spasms in a small animal (preferably a frog) to whom a minute amount of the suspected substance has been administered.

Brucine with concentrated nitric acid strikes a blood-red color, fading into yellow.

What are the physiological effects of nux vomica?

The effects of nux vomica are identical with those of its alkaloids. The action of *brucine* is similar to, but much weaker than, that of strychnine.

In *small doses* it increases the appetite and digestion and the peristaltic movements of the intestines. When continued for some time in small doses it is a cardiac and vaso-motor stimulant, and increases the sensibility of the sensory nerves and nerves of special sense, so that sight, hearing and touch are more acute, and also stimulates the respiratory centre. In *large doses* it causes malaise, restlessness, anxiety, muscular twitchings, and finally clonic convulsions. Strychnine acts principally on the *spinal cord*, stimulating especially its reflex, but also its motor, vaso-motor and sensory functions. After large doses, the reflex functions are so exalted that the slightest impression conveyed by a sensory nerve produces general convulsions. It is eliminated unchanged in the urine.

What are the symptoms and treatment of strychnine poisoning?

Sudden shuddering, quickly followed by tetanic convulsions of all the voluntary muscles, accompanied with muscular pains, opisthotonos, the *risus sardonicus* (a ghastly grin), a pale face, becoming livid from embarrassed respiration. After a time the muscles relax and an interval of quiet occurs, to be succeeded again and again by convulsions, if a liberal dose has been taken and is not antagonized by antidotes, until the sufferer dies of asphyxia from fixation of the respiratory muscles during a paroxysm; or the patient may die of paralysis and collapse during one of the intervals. The mind is clear to the end.

It *differs from tetanus* in history, in clonic (not tonic) spasms, in the muscles of the jaw not being affected before other voluntary muscles.

The *treatment* consists in (1) evacuating the contents of the stomach by emetics or the stomach-pump before the convulsive stage, or washing out the stomach under ether or chloroform if not seen until the convulsions have commenced; (2) giving tannic acid as a chemical antidote and chloral (hypodermically) as an antagonist; and (3) the frequent use of the catheter to prevent resorption of the poison from the bladder.

What are the therapeutical uses of nux vomica and strychnine?

It is employed (1) *as an excito-motor* in all cases of *paralysis* due to depression of the spinal or other motor centres, as in *diphtheritic*, *alcoholic*, or *lead paralyses*, *paraplegia*, *infantile paralysis* and *hemiplegia* after the subsidence of irritation. As it stimulates the nerve centres, it is *contraindicated* whenever inflammation or excitation of these centres is present; hence, in paralyses due to the presence of blood-clots it may do great injury if too early exhibited. In *constipation* due to atony and relaxation of muscular fibres, or in *diarrhœa*, *dysentery*, *impotence*, or *incontinence of urine* from the same cause, it is very useful. (2) In *amaurosis*, especially when due to the abuse of tobacco or of alcohol, and in *amblyopia* from disease, strychnine pushed to the verge of tolerance is very efficacious. It is more useful before atrophy of the optic nerve fibres has occurred. (3) As a *cardiac* and *respiratory stimulant* in *dyspnœa* depending on chronic bronchitis, emphysema, phthisis, or due to cardiac disease, as fatty or dilated heart, it is of value, and is often combined or *alternated with digitalis* in the latter affection. (4) As a *general* *tonic* it is advantageously given in *atonic dyspepsia*, *gastric catarrh*, *anæmia* and *chlorosis* (combined with iron), as an adjunct to quinine in obstinate *malarial fevers*, in various *neuralgiæ* occurring in debilitated subjects, and in *convalescence* from acute diseases (combined with iron and other tonics). Minute doses of nux vomica (tincture) will often arrest the *vomiting of pregnancy.*

What are the official preparations and their doses?

EXTRACTUM NUCIS VOMICÆ (*extract of nux vomica*), dose gr. ¼–j (0.016–0.065) given in pill. It is frequently combined with purgatives to enhance their effect.

EXTRACTUM NUCIS VOMICÆ FLUIDUM (*fluid extract of nux vomica*), dose ♏ij–x (0.12–0.61).

TINCTURA NUCIS VOMICÆ (*tincture of nux vomica*), dose ♏j–xx (0.06–1.2). Chiefly used as a bitter tonic.

STRYCHNINA (*strychnine*), preferably given as—

STRYCHNINÆ SULPHAS (*strychnine sulphate*), dose gr. $\frac{1}{30}$–$\frac{1}{20}$ (0.002–0.003) internally, or gr. $\frac{1}{60}$ (0.001), cautiously increased, if used hypodermically. As a cardiac tonic strychnine is often given in large doses, frequently repeated. It is not safe, however, to begin with a larger dose than gr. $\frac{1}{30}$–$\frac{1}{20}$ (0.002–0.003). As a tonic, minute doses may be given in pill, alone or combined with other medicines. In nervous affections it should be given in solution, the dose being gradually increased until slight muscular twitchings are produced.

Iron and strychnine citrate and *syrup of iron, quinine and strychnine phosphates* have been noticed with the iron preparations.

RHUS TOXICODENDRON.

What is this substance?

It is the *fresh leaves* of the Rhus radicans, poison-oak or poison-ivy (*Nat. Ord.* Anacardieæ), which contains *toxicodendric acid. Locally* applied it produces in many persons a very distressing eczematous eruption attended with much inflammation and swelling of the skin. Some persons are so susceptible that these symptoms occur if they are in the vicinity of the growing plant, even without coming in contact with it.

The treatment consists in alkaline washes, lotions of lead or corrosive sublimate (1 to 8000 or even weaker) or the application of carbolic acid in glycerin. *Internally* it is a gastro-intestinal irritant, causing also drowsiness, stupor, delirium and convulsions. Its precise use is not clear, but it has been given as a substitute for nux vomica in *paralysis* and in *incontinence of urine.* *Dose* gr. j–iij (0.06–0.19), perhaps, if given at all; best administered in the form of a tincture.

PICROTOXINUM—PICROTOXIN.

What is picrotoxin?

Picrotoxin is a *neutral principle* prepared from the seeds of Anamirta paniculata (*Nat. Ord.* Menispermaceæ), a climbing shrub of India. Its *action* on the brain resembles that of belladonna, while it affects the spinal centres somewhat like nux vomica: thus, it causes nausea, vertigo, delirium, incoördination, muscular twitching, followed by epileptiform convulsions, alternating tonic and clonic spasms, coma and cardiac paralysis. It stimulates all the motor and inhibitory centres of the medulla, particularly the respiratory and vagus centres, and excites the motor and reflex spinal centres. It is at present chiefly used to check the *night-sweats of phthisis*, but has also been recommended as an *excito-motor* in *functional paralysis* and in *paralysis* or *relaxation of the sphincters.* It is said to be of service in *chorea* when given in full doses. *Locally* it is used as an ointment (gr. v–x to ℥j (0.3–0.6 to 31.0)) in parasitic skin diseases and to destroy pediculi, but care should be used in applying it, as constitutional effects and even death have followed its employment externally. *Dose* gr. $\frac{1}{200}$–$\frac{1}{60}$ (0.0003–0.001).

ORDER VI.—DEPRESSO-MOTORS.

What are depresso-motors?

They are remedies which are used to depress the functions of the spinal cord, motor nerves or muscles, thus lessening motivity.

Name the members of this group.

Physostigma; chloral; the bromides; the nitrites; gelsemium; prussic acid; the cyanides; oil of bitter almonds; lobelia; conium; *woorara,* and tobacco.

PHYSOSTIGMA.

What is physostigma, and what active principles does it contain?

Physostigma, or Calabar bean, is the *seed* of P. venenosum (*Nat. Ord.* Leguminosæ), a plant found on the western coast of Africa. It contains an alkaloid called *eserine* or *physostigmine*, and it is claimed that a second alkaloid (a tetanizing agent), called *calabarine*, has also been discovered, but this is probably a derivative alkaloid of eserine.

What are the physiological effects of physostigma?

Calabar bean is a reflex depressant, causing also, in full doses, giddiness, slow and often irregular pulse, great muscular weakness, nausea and sometimes vomiting, generally free purgation, and usually contraction of the pupils. When poisonous doses are taken, there are, in addition, muscular tremors and abolition of reflex action, slow pulse and respiration, myosis and motor paralysis, and death from respiratory failure.

It depresses and finally paralyzes the *reflex and motor centres of the spinal cord*, having but slight effect upon the nerves themselves. It slows the heart (by greatly lengthening the diastolic pause) and increases its power (acting either on the cardiac motor-ganglia or muscle). The *blood pressure* at first falls, but soon rises and remains high until death approaches. It stimulates *intestinal peristalsis* and increases the secretions of the part. On the *eye* its action is probably directly opposed to that of atropine, for no matter how used it contracts the pupil, probably by paralyzing the peripheral sympathetic nerve-fibres in the iris and at the same time stimulating the end organs of the 3d pair of nerves. It is probably *eliminated* by the urine.

How should poisoning by this drug be treated?

(1) Give emetics and cathartics, and use a catheter to prevent further absorption of poison; (2) use atropine hypodermically as a physiological antagonist, and (3) give other cardiac and respiratory stimulants as digitalis, ammonia, and alcohol.

For what purpose is it employed medicinally?

As a *depresso-motor* it is used in *tetanus*, trismus neonatorum, *epilepsy* and *chorea* with some success. It has also been given as a physiological antagonist in *strychnine poisoning*, but is probably inferior to chloral for this purpose.

From its influence over *intestinal peristalsis*, it is advantageously used in *habitual constipation*, especially when associated with chronic intestinal dyspepsia and dry, hard stools. The *alkaloid* is used in ocular therapeutics, to prevent or overcome adhesions of the iris, lessen intra-ocular tension and contract the pupil.

What are its preparations and doses?

EXTRACTUM PHYSOSTIGMATIS (*extract of physostigma*), dose gr. $\frac{1}{12}$–$\frac{1}{2}$ (0.005–0.03).

TINCTURA PHYSOSTIGMATIS (*tincture of physostigma*), dose ♏v–xxx (0.3–2.0).

PHYSOSTIGMINÆ SULPHAS (*physostigmine sulphate*), a very deliquescent salt; dose $\frac{1}{60}$–$\frac{1}{12}$ (0.001–0.005).

PHYSOSTIGMINÆ SALICYLAS (*physostigmine salicylate*), preferred to the sulphate because of its greater permanency; dose gr. $\frac{1}{60}$–$\frac{1}{12}$ (0.001–0.005).

CHLORAL and THE BROMIDES have been discussed under the head of *hypnotics* (*vid.* pp. 95–99).

THE NITRITES.

What are the nitrites?

The *nitrites* are salts formed by the union of *nitrous acid** with a base.

Amyl nitris (*amyl nitrite*) is the only official organic nitrite (except the sweet spirits of nitre, which contains ethyl nitrite and will be considered elsewhere). It is a yellowish, oily, very volatile liquid, with a pleasant, fruity odor. *Nitroglycerin* (*trinitrin*, *trininitroglycerin* or *glonoin*) is a colorless, oily liquid, without odor, soluble in ether and alcohol. It forms the basis of various explosives. It is really a *trinitrate* (not a *nitrite*) of glyceryl or propenyl [$C_3H_5(NO_3)_3$]. *Potassium and sodium nitrites* are also used.

What is the physiological action of the nitrites?

They cause vertigo, headache, excited cardiac action, great dilatation of the arterioles and capillaries (from paralysis of their muscular coats), and consequently greatly diminished blood pressure, slowed respiration, lowered temperature, and diminished reflexes. After toxic doses, the pupils dilate, the muscular system relaxes, the blood becomes darker (probably from the formation of methemoglobin), the respiration and circulation become slow and irregular, and finally death occurs from respiratory failure, sensation and consciousness being preserved to the last. They depress both the *motor and reflex spinal* centres without influencing either the sensory nerves or centres. They first stimulate the *heart*, but soon depress and finally paralyze the cardiac muscle by direct action. The *temperature* is lowered, owing to lessened oxydation. The nitrites are all *muscle poisons*. They are *eliminated* by the urine, increasing greatly the amount of water and the uric acid and urea. The action of *amyl nitrite* is the most rapid, but most transient; *nitroglycerin* is the slowest, but its effects are more lasting,—the headache, however, which it causes, is very persistent, and often constitutes a great objection to its use. It sometimes causes nausea and vomiting.

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* See foot-note on p. 71.

What are the therapeutical uses of the nitrites?

The nitrites are used (1) as *depresso-motors* to relax spasm in *angina pectoris*, *asthma*, *tetanus*, puerperal and other forms of *convulsions*, *strychnine poisoning*, congestive and nervous *dysmenorrhœa*, and in all cases of very *high arterial tension* from spasm of the arterioles; thus, in *renal asthma* the inhalation of a few drops of amyl nitrite quickly relieves the spasm, and *migraine* with capillary spasm is frequently benefited by it. Given just before the expected chill of *malarial fevers* it will abort it, and sometimes avert the paroxysm. If amyl nitrite is inhaled when the "aura epileptica" is experienced, it will often prevent the *epileptic* attack. Nitroglycerin has proved of value in *chronic interstitial nephritis*, lessening the albuminuria and relieving the arterial spasm. Obstinate *hiccough* has been benefited by nitroglycerin.

(2) As *cardiac stimulants* the nitrites are employed in *syncope*, *cardiac dyspnœa*, and in *threatened cardiac failure* during the administration of anæsthetics, especially chloroform.

(3) They have also been found useful in the *nausea and vomiting* of sea-sickness and of pregnancy.

What are the doses of the nitrites, and how are they administered?

AMYL NITRIS (*amyl nitrite*), given internally or by inhalation; dose ♏ij–v (0.1–0.3).

SODII NITRIS (*sodium nitrite*), dose gr. ij–iij (0.1–0.2).

Potassium nitrite is not official. It may be used in the same doses as the sodium salt.

SPIRITUS GLONOINI (*spirit of glonoin—spirit of nitroglycerin*) is a 1 per cent. alcoholic solution of nitroglycerin, the dose of which is ♏ss (0.03) cautiously increased.

Triturates of nitroglycerin, each containing gr. $\frac{1}{100}$ (0.0006), are also employed.

Amyl nitrite is usually given by *inhalation*, but may be administered internally on sugar, or even hypodermically. The other preparations are given by the mouth. If a speedy action is required amyl nitrite should be used, and after the immediate danger is over, if it is desired to maintain the effect, the other nitrites or nitroglycerin may be given.

GELSEMIUM.

What is gelsemium, and what chemical principles does it contain?

Gelsemium is the *rhizome* and *roots* of G. sempervirens, the yellow or Carolina jasmine (*Nat. Ord.* Loganiaceæ), a climbing plant of the Southern States. It contains two alkaloids, *gelsemine* and *gelseminine*, combined with *gelseminic acid*, a volatile oil, resin, etc.

What are its physiological effects?

Small doses produce languor, dizziness, and perhaps slight lowering of the pulse rate; *large doses* diminish the force and frequency of the pulse and lower arterial pressure, depress respiration, cause frontal headache, and disordered, usually double vision; *toxic doses* cause extreme muscular weakness, partial blindness, dilated pupil, often internal strabismus, ptosis, incoördination, the jaw drops, articulation is impaired, general sensibility is much diminished, respiration is slowed, the pulse is very feeble, the temperature declines, a profuse cold sweat breaks out, and death occurs from *respiratory failure,* preceded in animals by convulsions followed by general paralysis. The mind remains clear until the end approaches. The paralyses of sensation and of motion appear to be of *spinal origin*, and the convulsions in animals have been attributed to excitation of the reflex spinal centres from *gelseminic acid*, which is supposed to be a tetanizing agent. The *respiratory centre* is depressed and finally paralyzed. The poison appears in toxic doses to depress the *heart* directly. It paralyzes the end-organs of the motor oculi, thus causing mydriasis with paralysis of accommodation and ptosis, and must also act on the 6th nerve, as the action of the external rectus muscle is much enfeebled.

What are its therapeutic uses?

It has been used as a *motor depressant* in *asthma*, *laryngismus stridulus*, *pertussis*, and *nervous cough* and *tic douloureux;* as a *sensor-depressant* in *trigeminal neuralgia*, especially when associated with spasm, and in various other *neuralgic affections;* as a *calmative* in *mania* (full doses); as a *cardiac sedative* in *sthenic fevers* and *inflammations*, and in *ocular therapeutics.* Its chief use is in neuralgia, especially of the 5th nerve.

What are its preparations and their doses?

EXTRACTUM GELSEMII FLUIDUM (*fluid extract of gelsemium*), dose ♏v–x (0.3–0.6) (fʒj (4.0) has proved fatal), repeated every 2 or 3 hours until constitutional effects are produced.

TINCTURA GELSEMII (*tincture of gelsemium*), dose ♏v–xx (0.3–1.2).

ACIDUM HYDROCYANICUM DILUTUM—DILUTED HYDROCYANIC ACID.

What are the sources of hydrocyanic acid?

Hydrocyanic or prussic acid exists in bitter almonds, peach kernels and leaves, wild cherry, etc., but is used in medicine only in a very diluted solution. The *diluted acid* is formed by the reaction of sulphuric acid and water upon potassium ferrocyanide or of hydrochloric acid on silver cyanide, and is a colorless, volatile liquid with an odor resembling that of bitter almonds. It contains 2 per cent. of the absolute acid.

How may the presence of prussic acid be detected?

1. The addition of a solution of silver nitrate produces a white

precipitate entirely soluble in boiling concentrated nitric acid. 2. The addition of a small amount of a mixed solution of ferrous and ferric sulphate, and afterward a little liquor potassæ, gives a dirty, greenish-blue precipitate, which changes to Prussian blue when slightly acidulated with hydrochloric acid.

What are its physiological effects?

Locally applied it passes through the cuticle and paralyzes the end-organs of the sensitive nerves beneath. When its vapor is inhaled or when the acid is taken in sufficient doses, it kills almost immediately, from arrest of circulation. If the toxic dose has not been large enough to arrest the circulation instantly, dyspnœa and depression of the heart occur, followed by dilated pupils, convulsions and unconsciousness, and death from asphyxia and collapse.

The convulsions are of *cerebral* origin. Prussic acid is a direct nerve and muscle poison. In large doses it causes diastolic arrest by direct action either on the *heart muscle* or its contained ganglia: in small doses it slows the heart by stimulation of the inhibitory centres. It stimulates at first the vaso-motor system and for a short time raises arterial tension, but it soon depresses and finally paralyzes the vaso-motor apparatus and the blood pressure falls. The venous blood at first becomes of an arterial hue but soon darkens, and after death even the arterial blood has lost its bright color. The cause is not well understood. Asphyxia is due to paralysis of the respiratory centre. It is rapidly eliminated by the lungs and kidneys.

How should poisoning by prussic acid be treated?

Evacuate, if possible, the contents of the stomach; give atropine hypodermically as a respiratory stimulant; give ammonia freely by inhalation, by the mouth and by intra-venous injection; practice artificial respiration assiduously and use alternate hot and cold douches. Death usually results so rapidly that nothing is of much service.

What are the medicinal uses of diluted hydrocyanic acid?

It is used (1) as a *depresso-motor* and *nerve sedative* in various forms of *cough*, as that of phthisis, also in *asthma* and in *whooping* cough. In obstinate *vomiting* it is sometimes successful. In *gastrodynia and in enteralgia* it has proved beneficial, probably by a local action on the nerves of the parts. When successful in these cases, it is so speedily.

(2) *Locally* (fʒj–iij to Oj (4.0–11.0 to 480.0)) it is used as an *anodyne* in neuralgia and in many cutaneous affections attended with pruritus. Great caution should be used when it is thus applied, as fatal results have attended its absorption through an abraded surface.

How is it administered?

ACIDUM HHDROCYANICUM DILUTUM (*diluted hydrocyanic acid*), dose gtt. j–iij (0.06–0.18) diluted.

THE CYANIDES.

What are the effects, uses and doses of the cyanides?

POTASSII CYANIDUM (*potassium cyanide*). *Locally* it is an irritant. It may be absorbed through the skin, when the application is prolonged, and cause poisoning. When administered *internally* it reacts with the acids of the gastric juice and prussic acid is set free, consequently the systemic effects are identical with those of that acid, as a substitute for which it is used. Dose gr. $\frac{1}{12}$–$\frac{1}{8}$ (0.005–0.008).

ARGENTI CYANDIUM (*silver cyanide*) is only used in medicine in making prussic acid.

Mercury cyanide has been noticed among the mercurial preparations.

OLEUM AMYGDALÆ AMARÆ—OIL OF BITTER ALMOND.

What are the effects, uses, and dose of this oil?

Oil of bitter almond is a volatile oil obtained by distillation from the *kernel* of the fruit of Prunus Amygdalus (*var.* amara., *Nat. Ord.* Rosaceæ). It contains *benzoic aldehyd* and *hydrocyanic acid* (due to the reaction of *amygdalin* with water, in the presence of an albuminous ferment called *emulsin*). Its effects and uses are the same as those of prussic acid. Dose ♏$\frac{1}{4}$–ss (0.015–0.03), in emulsion.

AQUA AMYGDALÆ AMARÆ (*bitter almond water*) contains $\frac{1}{10}$ of 1 per cent. of the oil, and is used as a vehicle; dose fʒj–iv (4.0–15.0).

SPIRITUS AMYGDALÆ AMARÆ (spirits of bitter almond—essence *of bitter almond*) contains 1 per cent. of the oil; dose ♏j–xx (0.06–1.2).

Syrupus Amygdalæ (*syrup of almonds*), made from both sweet and bitter almonds, is used as a vehicle.

Emulsum Amygdalæ (*almond emulsion—milk of almonds*), made from the sweet almonds alone, is also used as a vehicle.

LOBELIA.

What is lobelia, and what are its active ingredients?

Lobelia is the *leaves* and *tops* of L. inflata, or Indian tobacco (*Nat. Ord.* Lobeliaceæ), an indigenous plant. It contains an *alkaloid*, *lobeline;* also *lobelic acid*, fixed and volatile oils, etc.

What are its effects and uses?

In *large doses* it causes nausea, violent vomiting with great depression, sometimes purging, feeble pulse, almost complete muscular relaxation, and, if a *lethal dose* has been taken, collapse, coma, sometimes preceded by convulsions, and death from paralysis of the respiratory centre.

Large doses appear to paralyze the motor nerves, the vaso-motor centre and the peripheral vagi. Its action has not been fully studied.

The *treatment of lobelia poisoning* consists in emetics, tannic acid, morphine, alcohol, ammonia and counter-irritation to the surface.

It is *used* as a *depresso-motor* and *expectorant* in *asthma* and in *acute bronchitis* with spasmodic dyspnœa. In other spasmodic diseases it has been superseded by more reliable and less dangerous remedies. It is too depressing in its action to be used as an emetic.

Locally, in infusion (℥j to Oj (30.0 to 480.0)), it is highly recommended as an application to *poison-oak eczema.*

What are the preparations of lobelia and their doses?

Extractum Lobeliæ Fluidum (*fluid extract of lobelia*), dose as an *expectorant* ♏j–v (0.06–0.3); as an *emetic* ♏xv–xx (1.0–1.2).

Tinctura Lobeliæ (*tincture of lobelia*), contains 20 per cent. of lobelia; dose as an *expectorant* ♏x–xx (0.6–1.2); as a *motor-depressant* in asthma fʒj (4.0) repeated every ½–1 hour until nausea is experienced.

CONIUM.

What is conium, and what active principles does it contain?

Conium is the *full-grown fruit* of C. maculatum, or hemlock (*Nat. Ord.* Umbelliferæ), gathered while yet green and carefully dried. The *active principle* is *conine*, a volatile *liquid alkaloid.* It also contains *conydrine*, *methyl-conine*, and *pseudoconydrine.*

What are its physiological effects?

Full medicinal doses cause great muscular weakness, first felt in the lower extremities, difficulty in keeping the eyelids raised, and disordered vision from paralysis of accommodation. Sometimes the pupils dilate, and sometimes there is nausea and vomiting. After a *poisonous amount* has been taken, these symptoms are intensified, and difficulty of speech, delirium or coma, paralysis, and death from asphyxia, preceded by convulsions of cerebral origin, occur. Conium has little if any action on the *cerebral hemispheres*, and but little is known of its influence on the *spinal cord.* It paralyzes the peripheral ends of *nerves*, acting much more powerfully on the motor than on sensory fibres. The effects on the *ocular apparatus* are due to peripheral oculo-motor paralysis. The *pulse* is at first accelerated (paralysis of the vagi), but afterward slowed (depression of cardiac-motor nerves), and the blood pressure, which was primarily lowered, is raised when symptoms of asphyxia take place. It is eliminated by the urine. The *treatment of poisoning* consists in evacuating the contents of the stomach, giving tannic acid as an antidote, maintaining artificial respiration and administering, as antagonists, atropine, and strychnine or picrotoxin.

What are the medicinal uses of conium?

Conium has been used as a *depresso-motor* in *whooping-cough*, *paralysis agitans*, *chorea*, *blepharospasm*, *asthma* and other spasmodic affections. It has been used as a *calmative* and *relaxant* in *maniacal* and *hysterical excitement*, and also in *melancholia.* As an *anodyne* it is employed internally and locally in *cancer*, and in *neuralgia*, especially *sciatica.*

What are the preparations and doses of conium?

EXTRACTUM CONII (*extract of conium*), dose gr. j (0.06).

EXTRACTUM CONII FLUIDUM (*fluid extract of conium*), dose ♏j–v (0.06–0.3).

As different samples of the drug vary much in the amount of conine contained, it is safer to begin with a small dose, to be gradually increased until some effect is obtained.

WOORARA.

What is woorara?

Woorara (not official), called also woorali and curare, is an extract prepared by the South American Indians from Strychnos toxifera and other species of Strychnos (*Nat. Ord.* Loganiaceæ), and is used by them as an arrow-poison. It *contains* an alkaloid called *curarine.*

What are its effects and uses?

It is eliminated so rapidly that usually when administered internally no symptoms result. When it enters the system through a wound or by hypodermic injection it paralyzes the peripheral endings of the *motor nerves*, and if the dose be sufficiently large the *vagus* and the ends of the *sensory nerves* are also paralyzed. After a time the *nerve trunks* and the *spinal cord* are also affected. The *voluntary muscles* are uninfluenced. Large amounts lower the *blood pressure* and finally depress the *heart.* Death results from paralysis of the motor respiratory nerves. Small doses increase all the secretions. It is *eliminated* chiefly by the urine.

The *treatment of woorara-poisoning* consists in frequent catheterization to prevent resorption, artificial respiration, and atropine and strychnine, hypodermically as antagonists.. They can scarcely be relied on.

Woorara is *used* as a *depresso-motor* in *tetanus* and in *hydrophobia*, and has also been employed in *epilepsy* and in *chorea.* It is given in doses of gr. $\frac{1}{10}$ (0.006), or its alkaloid, curarine, may be used in doses of gr. $\frac{1}{200}$–$\frac{1}{100}$ (0.0003–0.0006).

TABACUM—TOBACCO.

What is tobacco, and what does it contain?

Tobacco is the commercial, *dried leaves* of Nicotina Tabacum (*Nat. Ord.* Solanaceæ). It contains *nicotine*, a volatile *liquid alkaloid; nicotianin* (tobacco-camphor) and an empyreumatic oil.

What are its effects and uses?

To persons unaccustomed to its use, tobacco or nicotine is a depressant, nauseant and emetic, and causes dizziness and weakness. When a toxic dose is taken, purgation, diuresis, cramps or convulsions, followed by great muscular weakness and, finally, paralysis, a rapid, feeble and compressible pulse, collapse and death from paralysis of the respiratory muscles.

It first stimulates the *spinal* centres (thus causing convulsions), but probably finally paralyzes them. It first excites and then abolishes the functions of the peripheral endings of motor nerves, the nerve trunks being afterward affected, but has no influence on voluntary muscles. The *cardiac* action is first depressed from some unexplained cause, afterward much increased, probably from paralysis of the peripheral inhibitory nerves, and the blood pressure, which at first falls, is afterward elevated. Nicotine contracts the pupil, whether applied locally or administered internally.

Tobacco increases intestinal peristalsis, and is probably eliminated chiefly by the urine, which it greatly increases.

The *treatment of nicotine poisoning* consists in emetics or washing out the stomach, tannic acid and strychnine with artificial respiration.

Tobacco is not much *used* at present as a *depresso-motor*, but may be employed for this purpose in *tetanus* and in *strychnine poisoning.* In persons unaccustomed to its use, smoking a strong cigar may relieve an attack of *spasmodic asthma.* As a *local anodyne*, it has been used as a poultice to *painful ulcers*, as an ointment to inflamed *hemorrhoids*, and as a lotion to relieve *pruritus.* Great caution should be observed, as its local use has resulted in poisoning and death. There are no *official preparations.* Dose gr. j–iij (0.06–0.19), in infusion, which in poisoning by strychnine or in tetanus must be frequently repeated until some results are obtained.

(B) ON THE ORGANS OF CIRCULATION.

ORDER I.—CARDIAC STIMULANTS.

What are cardiac stimulants?

They are medicines which are administered with a view of increasing the power of the heart or the force of the circulation.

Mention the remedies of this order.

Alcohol, ether, the ammonium preparations, amyl nitrite, nitroglycerin, atropine, digitalis, caffeine, adonidine, strophanthus, sparteine, strychnine, cimicifuga.

ALCOHOL.

What is alcohol?

Alcohol (ethyl hydrate) results from the fermentation of substances containing grape sugar. It is a colorless, inflammable liquid, uniting in all proportions with water. *Alcohol* contains 94 per cent. by volume of absolute alcohol, which is not used in medicine.

What are the physiological effects of alcohol?

Locally applied it is an astringent. It evaporates rapidly and produces a feeling of cold, but if evaporation is prevented it acts as an irritant. When its vapor is *inhaled* it causes anaesthesia, coma and death. Taken *internally in small doses* it increases appetite and digestion, temporarily increases the force and frequency of the cardiac systole, dilates the vessels, thus causing a sensation of warmth, and diminishes the amount of urea and of carbonic acid eliminated. The *continued use* of small doses disorders the digestion and the hepatic functions, produces gastric catarrh and hyperplasia of the connective tissues, resulting in sclerosis of different viscera, and tends to the production of fatty degeneration of the walls of the vessels and various organs.

Large doses disorder digestion and cause the well-known alcoholic intoxication with muscular incoordination and weakness, hallucinations, lowered temperature, depression of the heart and reflexes, and stupor.

Toxic doses cause death from respiratory or cardiac failure may rapidly result, preceded by insensibility, stertorous breathing and coma and occasionally by convulsions.

In small doses it stimulates the cardiac motor ganglia and the heart muscle, followed, if a large dose be taken, by depression and paralysis of the cardiac muscle. Large doses also paralyze the vasomotor system and dilate the vessels.

Small doses slightly increase the *temperature* of the body, but large doses reduce it by interfering with the oxygen-carrying function of the red corpuscles and with the nutritive process, and by dilating the cutaneous vessels. *Respiration* is first quickened, then slowed, and after fatal doses, paralyzed. It is a *cerebral* stimulant, but in toxic doses depresses the encephalic mass, the *spinal* reflex centres, the conductivity of both motor and sensory nerves, and finally the reflex functions of the medulla. It diminishes the *excretion* of nitrogenized waste, and is *eliminated* principally by the kidneys, lungs and skin, although a certain amount (more in proportion to the smallness of the dose) disappears in the system.

How should acute alcohol-narcosis be treated?

The contents of the stomach should be evacuated, ammonia or strychnine should be given, and the hot and cold douche alternately used.

What are the medicinal uses of alcohol?

As a *cardiac stimulant*, alcohol is used in *syncope* from exhaustion, loss of blood, surgical shock and other forms of fainting, and where *cardiac failure* is threatened, as in typhoid and typhus fevers.

As a *general stimulant* to the system in all *wasting diseases*, as *phthisis*, *scrofula* and prolonged *suppuration*, and in all low states of the system, as *typhoid* and *typhus fevers*, *diphtheria*, *pyæmia* and *septicæmia*. In these fevers a tolerance to alcohol is present, and it may be given in large quantities without causing intoxication. It not only aids the digestion of food in these conditions, but as very little of what is taken can be found in the excretions, it seems to be used by the system, and consequently may be classed *as a food* in these diseases. The dose in these diseases must be regulated by the pulse principally. When the pulse is quickened and more bounding, the face flushes, the temperature rises, and the breath smells strongly of alcohol, the patient is taking more than the system can use, and the dose should be decreased.

As an antidote to *snake bite* or other cardiac depressant, as aconite or *veratrum viride*, it is of great service. In poisoning by snake bite it is given in frequently repeated doses almost *ad libitum*, conjoined with intravenous or, at least, hypodermic injection of ammonia.

To *improve digestion* and *nutrition*, it is useful in many chronic diseases, but the danger of forming the alcohol habit should always be borne in mind when it is thus prescribed.

Locally, alcohol is used as an *antiseptic* and *stimulant* dressing for wounds, to harden the cuticle when *bed sores* are imminent, and as a *tonic* and *cooling lotion*.

What are the official preparations of alcohol?

ALCOHOL ABSOLUTUM (*absolute alcohol*) is ethyl alcohol containing not more than 1 per cent., by weight, of water. It is not used medicinally.

ALCOHOL DEODORATUM (*deodorized alcohol*) is a liquid composed of about 92.5 per cent. by weight, or 95.1 per cent. by volume, of ethyl alcohol and about 7.5 per cent. by weight of water.

It is used in making various medicinal preparations into which alcohol enters.

ALCOHOL (*alcohol*) contains 94 per cent. by volume of absolute alcohol; sp. gr. 0.820.

ALCOHOL DILUTUM (*diluted alcohol*) contains 48.6 per cent. by volume of absolute alcohol; sp. gr. 0.936.

SPIRITUS FRUMENTI (*whiskey*), an alcoholic liquid obtained by the distillation of the mash of fermented grain (usually of mixtures of corn, wheat, and rye), and at least 2 years old; it contains 50 to 58 per cent. by volume of alcohol; sp. gr. 0.917–0.930).

SPIRITUS VINI GALLICI (*brandy*) an alcoholic liquid obtained by the distillation of fermented, unmodified juice of fresh grapes, and at least 4 years old; it contains from 46 to 55 per cent. by volume of alcohol; sp. gr. 0.925–0.941. It contains some tannic acid, and is astringent. It is, therefore, preferable to whiskey if there is looseness of the bowels. It also is a stomachic sedative, and, next to champagne, tends to check vomiting more than any other alcoholic liquid.

VINUM ALBUM (*white wine*), an alcoholic liquid, made by fermenting the juice of fresh grapes, the fruit of Vitis vinifera (*Nat. Ord.* Vitaceæ), freed from seeds, stems, and skins, contains 10 to 14 per *cent. by weight of* absolute alcohol.

VINUM RUBRUM (red wine), an alcoholic liquid made by fermenting the juice of fresh colored grapes, the fruit of Vitis vinifera (*Nat. Ord.* Vitaceæ), in the presence of their skins, and contains from 10 to 14 per cent. of absolute alcohol. It is somewhat astringent.

How is alcohol administered?

Wines may be given pure or mixed with water. Brandy and whiskey are given pure or diluted with water, especially when administered as cardiac stimulants, or in the form of milk punch or egg-nog, when used as a food to support the system.

They may also be injected per rectum, and, if cardiac failure is imminent, brandy may be used hypodermically.

ÆTHER—ETHER.

Is this substance ever used as a cardiac stimulant?

The use of *ether* as a cardiac stimulant has already been mentioned. It acts rapidly, but transiently, and may be used internally, or better still, hypodermically in cases of sudden cardiac failure.

AMMONIUM.

What are the sources of ammonium?

Ammonium is abundantly present in nature as the result of animal and vegetable decay, but is chiefly obtained for commercial purposes from the ammoniacal liquor of gas works.

What are the general physiological actions of ammonium preparations?

Ammonia Gas in solution is an irritant. Kept in contact with the skin it reddens and finally vesicates. When the gas is *inhaled* it irritates, producing a sense of suffocation, spasm, and, if continued, inflammation of the air passages. When *injected* into the veins of animals in sufficient quantities, it damages the blood and causes convulsions, rapid respiration and death.

Ammonia temporarily stimulates the accelerator nerves of the *heart*, thus increasing the rapidity of its action. After intravenous injection, the *blood pressure* at first falls, but rapidly rises as the pulse becomes quicker. It aids in maintaining the fluidity of the *blood* by retaining the fibrogenous materials in solution. In toxic amounts, the oxygen-carrying function of the *red corpuscles* is interfered with. Intra-venous injections of ammonia quicken respiration by powerfully stimulating the respiratory centres. The convulsions are due to stimulation of the *motor and reflex spinal centres.* It is *eliminated* chiefly by the urine as uric acid and, perhaps, as urea. Its salts are also eliminated by the broncho-pulmonary mucous membrane. When taken internally in medicinal doses it is antacid and carminative, but if continued for too long a period, it disorders digestion and causes emaciation.

What are the symptoms and treatment of poisoning by ammonia?

When a strong solution is swallowed it causes inflammation of the lips, mouth, fauces, pharynx, œsophagus and stomach. Œdema of the glottis may occur, and secondary strictures of the œsophagus or even of the pylorus may result. Death may be due to asphyxia or to collapse preceded by symptoms of corrosive poisoning. The *treatment* consists in neutralizing the alkali by vegetable acids (vinegar); protecting the injured surfaces by oils and demulcents and the occasional passage of an œsophageal bougie, for at least a year, to prevent secondary stricture. The occurrence of œdema of the glottis demands immediate tracheotomy.

What are the therapeutical uses of the ammonium preparations?

Ammonia is a rapid and powerful *cardiac stimulant*, but its effects are of brief duration. It is used for this purpose both internally and by inhalation in all cases of acute *cardiac failure*, and may be used to antagonize the action of *snake poison* and *prussic acid* on the heart, but should here be employed as an adjuvant to alcohol.

For *sudden cardiac failure* during *anæsthesia* or from *surgical shock* it may be given hypodermically.

It has been used by intra-venous injection to *maintain the fluidity of the blood* in cases of threatened *cardiac thrombosis;* and as a *stimulating expectorant* in *pneumonia*, especially when typhoid symptoms are present. It is given *as an alkali* in *acidity*, *flatulence* and in *nervous headache.*

Externally it is an ingredient of stimulating and irritating liniments and may be used as a vesicant.

What preparations of ammonium are used as cardiac stimulants?

Aqua Ammoniæ Fortior (*stronger ammonia water*) contains 28 per cent. by weight of gaseous ammonia. It is a powerful corrosive poison. It is best adapted for hypodermic use in doses of ♏x–xxv (0.6–1.5), diluted with four times its volume of water, and repeated in 15 minutes if necessary, and may be used externally as a rapid (but painful) vesicant by inverting a watch crystal full of it on the skin.

Aqua Ammoniæ (*ammonia water*) contains 10 per cent. by weight of ammonia-gas; *dose* for internal use, gtt. x–xxx (0.6–2.0) freely diluted.

Spiritus Ammoniæ (*spirit of ammonia*) contains 10 per cent. by weight of the gas in solution in alcohol; dose ♏x–xxx (0.6–2.0) freely diluted.

Spiritus Ammoniæ Aromaticus (*aromatic spirit of ammonia*) contains also ammonium carbonate and aromatics; dose fʒss–j (2.0–4.0), freely diluted.

Ammonii Carbonas (*ammonium carbonate*) is used as a cardiac stimulant, and also in threatened thrombosis. It is very valuable as a stimulating expectorant in capillary bronchitis, typhoid pneumonia, and other low forms of chronic pulmonary disease where an expectorant is required. Dose gr. v–x (0.3–0.6).

The *iodide*, *bromide* and the *acetate*, *tartrate*, and *citrate of iron* and *ammonium*, and *valerianate of ammonium* have already been noticed; the *acetate*, *benzoate* and *chloride* will be discussed hereafter. The *nitrate of ammonium* is only used in making other official preparations.

AMYL NITRIS—AMYL NITRITE—NITROGLYCERIN.

Are these substances used as cardiac stimulants?

Inhalations of amyl nitrite have been employed in cases of *sudden heart-failure*, as in *fatty heart*, or *during anæsthesia*. *Nitroglycerin* has been used also as a cardiac stimulant, especially in cases associated with high arterial tension. These remedies have been discussed under the head of Depresso-Motors.

ATROPINÆ—ATROPINE.

Is atropine used as a cardiac stimulant?

Atropine (*vid. belladonna*, p. 107) is used as a cardiac stimulant in cases of sudden or threatened heart-failure. Dose gr. $\frac{1}{120}$–$\frac{1}{60}$ (0.0005–0.001), given hypodermically.

DIGITALIS.

What is digitalis?

Digitalis is the *leaves* of D. purpurea, or purple foxglove (*Nat. Ord.* Scrophularineæ), obtained *from plants of the second year's growth.* It is a European plant, cultivated in this country.

What are its chemical constituents?

The constituents of digitalis* are, *digitalin*, *digitalosmin* (stearopten), *digitaleic acid*, *resin*, *mucilage*, etc. "Commercial digitalin is a mixture of several compounds of which the following have been investigated to some extent:" *Digitoxin; Digitonin*, a crystallizable glucoside, is decomposed by warm hydrochloric acid into dextrose, galactose and digitogenin; *Digitalein; Digitalin*, and *Digitin.* All these principles except the last are cardiac poisons.

What are the physiological effects of digitalis?

Its effects are much more slowly produced, but are much more lasting than those of the medicines previously considered, and it is therefore more of a tonic than a stimulant to the heart. In *moderate doses* it slows and strengthens the cardiac beat, elevates the blood pressure and causes diuresis. It sometimes interferes with the appetite and digestion. After very *large doses*, or when too long continued, nausea and vomiting may occur; the pulse becomes dicrotic, weak, and sometimes rapid, and diaphoresis more or less profuse takes place. *Toxic doses* cause the same symptoms, and in addition vertigo, disordered vision, lowered reflexes, muscular tremors, lassitude, reduced temperature, delirium, stupor, usually convulsions, and death from cardiac paralysis.

In moderate doses it stimulates the peripheral cardio-inhibitory fibres of the vagi (thus slowing the *heart* by increasing the length of the diastole), the cardiac muscle and its contained motor ganglia (thus increasing the strength and force of the systole), and the vasomotor centres (thus raising the arterial tension). It also acts directly on the muscular walls of the vessels, and thus lessens their calibre.

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* A Manual of Organic Materia Medica, by John M. Maisch, Ph. M., *Pharm. D.*, 6th ed., 1895, pp. 228, 229.

When full medicinal doses are taken, or when the pulse has been greatly slowed by it, a sudden change from the recumbent to the erect posture may give rise to a small, weak, rapid pulse, with lowered arterial tension.

When *fatal doses* are taken the heart is arrested in systole.

In poisonous doses it lowers *reflex action* by stimulating Setschenow's inhibitory reflex centres and, later, by paralyzing directly the spinal cord. It also lowers the contractility of *muscles.* It usually proves *diuretic*, probably from elevating the arterial tension. It is *eliminated* chiefly by the urine.

How should poisoning by digitalis be treated?

(1) Give emetics and cathartics to remove the poison from the alimentary canal; (2) tannic acid as a chemical antidote; alcohol, ammonium carbonate and opium, or saponin, as physiological antagonists.

What are the medicinal uses of digitalis?

As a *cardiac tonic* digitalis is used in all cases of loss of cardiac power, as in *dilatation* or in *weakness of the cardiac muscle. It should never be prescribed* in simple hypertrophy, nor when hypertrophy is sufficient to compensate for valvular lesion. In advanced cases of fatty heart, it should be used very cautiously, if at all, as the increased systolic power which it induces may lead to rupture of the friable cardiac walls. In *valvular diseases*, when the hypertrophy is not compensatory, or when dilatation is taking place, it is invaluable. In "*irritable heart,*" *functional palpitation* and *venous engorgements* (by lengthening the diastole it allows the veins more time to empty their contents into the auricles), it is much used. The tincture (♏x–xx (0.6–1.2)) may be employed hypodermically in cases of *sudden cardiac failure.* To sustain the action of a depressed heart in various acute diseases, particularly in *pneumonia*, it is often administered.

In *delirium tremens*, where the pulse is soft and compressible, digitalis is often given in large doses with benefit.

It is also used as a *physiological antidote* to poisoning by *aconite*, *delphinine* and *muscarine*, all of which arrest the heart in diastole.

To *contract the blood vessels* it has been used in *acute inflammations* and in *hemorrhages*, and as it is supposed to stimulate involuntary muscle-fibres generally, it is given in *menorrhagia* and in *spermatorrhœa.*

As a *cardiac tonic* and *diuretic* it is used in all forms of *cardiac* and of *renal dropsy*, in acute *suppression of urine* and in *acute desquamative nephritis.*

What are the preparations of digitalis, and how are they administered?

Digitalis leaves are sometimes given in powder or pill, dose gr. j (0.06) t. i. d., gradually increased. The official preparations are—

EXTRACTUM DIGITALIS (*extract of digitalis*), dose gr. ¼ (0.016), gradually increased.

EXTRACTUM DIGITALIS FLUIDUM (*fluid extract of digitalis*), dose ♏j (0.06).

TINCTURA DIGITALIS (*tincture of digitalis*), dose ♏v–x (0.3–0.6), gradually increased.

INFUSUM DIGITALIS (*infusion of digitalis*), one of the best preparations; dose fʒss–jv (2.0–15.0).

Occasionally after digitalis has been taken for some time continuously, especially when free diuresis has not taken place, its action becomes suddenly manifested by the pulse rapidly falling and the supervention of other effects characteristic of the drug. This is probably due to some delay in the absorption or elimination of the medicine, and when it occurs the remedy should be promptly discontinued. So-called *commercial digitalin* should never be prescribed because of its variable composition. *Merck's German digitalin* is a stable and valuable remedy, representing the full value of digitalis, without its irritating effects upon the digestive tract. Dose gr. 1/10–½ (0.006–0.03).

CAFFEINA—CAFFEINE.

What is caffeine?

Caffeine (*theine*) is a feebly basic, *proximate principle*, obtained from the *dried leaves* of Thea sinensis or tea plant (*Nat. Ord.* Ternstræmiaceæ), from the *dried seeds* of Coffea arabica or coffee plant (*Nat. Ord.* Rubiaceæ), or from *guarana* (a paste prepared from the crushed or ground seeds of Paullinia cupana (*Nat. Ord.* Sapindaceæ). Guarana is official.)

What are its physiological actions?

In *medicinal doses*, caffeine is a cerebral stimulant, causing nervous restlessness, increased mental activity and wakefulness; it also increases the cardiac force, raises the arterial pressure, and acts as a decided diuretic. After *poisonous amounts*, there is also confusion of thought, with delirium, muscular tremblings, cardiac oppression, quickened respiration, cold extremities, symptoms of collapse, rise of temperature, and (in animals) tonic and clonic convulsions, muscular weakness, general paresis, and death from paralysis of respiration.

It increases the power of the *heart* and raises *arterial tension*, probably by a direct stimulant effect upon the heart muscle. It is *diuretic*, not only indirectly by increasing the blood pressure, but also by some direct action on the secreting cells of the kidney itself. The *convulsions* are probable due to spinal stimulation. In moderate doses, caffeine is said to be entirely destroyed in the system; in toxic doses, it is partly destroyed and partly eliminated by the kidneys. Its effect on the elimination of waste products is at present uncertain.

What are its medicinal uses?

As a *cardiac tonic* (more rapid in action, but not so enduring as digitalis), it is used to meet the same indications which call for the use of digitalis. In cases of *sudden heart failure*, it may be used hypodermically combined with equal parts of sodium salicylate, which renders it more soluble in water.

As a combined *cardiac stimulant* and *diuretic* it is very useful in the latter stages of *chronic Bright's disease* with weak heart.

As a *diuretic* in all *renal* and *cardiac dropsies* it is very serviceable. It is also employed as a *cerebral stimulant* in nervous and neuralgic *headaches*, and combined with other antagonists in opium *poisoning*.

How is caffeine administered?

CAFFEINA (*Caffeine*) may be given in pill, capsule or solution, dose gr. j–v (0.06–0.3) or more. For administration in fluid form *caffeine citrate* (so-called) is preferred as more soluble.

When given as a *cerebral stimulant*, one dose of gr. ij–v (0.13–0.3) is usually sufficient, but as a *cardiac tonic* and *diuretic* this dose should be repeated twice daily, and gradually increased if necessary up to gr. x–xij (0.6–0.8).

CAFFEINA CITRATA (*citrated caffeine*), dose gr. ij–v (0.13–0.3).

CAFFEINA CITRATA EFFERVESCENS (*effervescent citrated caffeine*), dose ʒj–iij (4.0–12.0).

GUARANA (*Guarana*) contains *tannic acid* as well as *caffeine* in considerable quantities, and is principally used in *neuralgic* and in *sick-headache*. In Brazil, whence it comes, it is also used as an astringent in diarrhœal affections, dose ʒj (4.0).

EXTRACTUM GUARANÆ FLUIDUM (*fluid extract of guarana*), dose ♏x–xx (0.6–1.2).

ADONIDIN.

What is adonidin?

Adonidin (not official) is a glucoside, obtained from the root of Adonis vernalis (*Nat. Ord.* Ranunculaceæ), a plant of northern and central Europe.

What are its effects, uses and modes of administration?

The *effects* of adonidin are almost identical with those of digitalis (but are much more quickly produced), as it stimulates the cardiac muscle and contained motor ganglia, thus increasing the force of the cardiac contractions at the same time that, by stimulating the inhibitory fibres of the vagi, it increases the length of the diastole and thus slows the heart. The arterial tension is also elevated, probably by stimulation of the vaso-motor centres. In large doses it paralyzes both the heart and vessels, the arterial tension falls and the heart is finally arrested in diastole. It sometimes (not as frequently as does digitalis) causes nausea, vomiting and diarrhœa. It sometimes proves diuretic. It is *used* as a *cardiac tonic* in the same class of diseases in which digitalis is employed, and may be *substituted for it where the latter* disagrees or is too slow in its action.

It may be alternated with digitalis for a few weeks during a course of the latter. Dose gr. $\frac{1}{8}$–$\frac{1}{2}$ (0.008–0.03) every 3 or 4 hours, in pill or capsule.

STROPHANTHUS.

What is strophanthus?

Strophanthus is the *seed* of S. hispidus (*Nat. Ord.* Apocynaceæ), an African plant which has been used by the natives as an arrow-poison, and called by them Kombé or Ineé. It contains a crystalline glucoside, called *strophanthin.*

What are its effects, uses and modes of administration?

The effects of *strophanthus* are more rapid in action, but much more evanescent, than those of digitalis. It appears to act upon the muscles directly, and to have little or no effect upon the nervous system.

In *moderate doses* it greatly increases the strength of the cardiac systole, prolongs the diastole and increases the arterial tension probably by acting on the muscular walls of the vessels. In *large doses* it increases the contractibility of all the striated muscles and finally arrests the heart in systole.

It proves diuretic by increasing the arterial tension, and has no cumulative effects. It is *used* as a substitute for digitalis in *cardiac diseases* when a temporary effect or a temporary change of medicines is desirable. From its *diuretic* action it has been successfully employed in various forms of *œdema* depending on a weak circulation and general *cardiac* and *renal dropsies.* The *tincture of strophanthus* (*tinctura strophanthi*—5 per cent. by weight) is used; dose ♏j–x (0.06–0.6) t. i. d.; or *strophanthin* may be cautiously administered hypodermically; dose gr. $\frac{1}{100}$–$\frac{1}{60}$ (0.0006–0.001).

SPARTEINÆ SULPHAS—SPARTEINE SULPHATE.

What is sparteine?

Sparteine is a *liquid alkaloid* obtained from Cytisus Scoparius, or broom (*Nat. Ord.* Leguminosæ).

What are its effects and uses, and how is it administered?

Sparteine is a cardiac tonic, in *moderate doses* increasing the force *and persistence* of the cardiac contractions by direct action upon the heart or its contained motor ganglia, and at first increasing its frequency by paralyzing the vagi, afterward decreasing the pulse-rate by its direct action on the heart. When the cardiac rhythm is disturbed it renders its contractions regular. In *large doses* it depresses the heart and causes death from paralysis of the respiratory centre. It depresses the cerebral and spinal centres. It has no diuretic properties. It has been *used* as a substitute for digitalis in *cardiac diseases*, and in cases of feebleness and irregularity of cardiac action. It is inferior to digitalis as a cardiac tonic, but may be used as a succedaneum to it. It is administered in the form of *sulphate* (official), of which the dose is gr. $\frac{1}{20}$–$\frac{1}{4}$ (0.003–0.01), hypodermically; or if given internally, gr. $\frac{1}{4}$–j or ij (0.01–0.06–0.13) in capsule or pill.

STRYCHNINA—STRYCHNINE.

Is strychnine prescribed for its cardiac effects?

The use of strychnine as a cardiac tonic has been noticed under the head of nux vomica (*q. v.*); dose gr. $\frac{1}{30}$–$\frac{1}{20}$ (0.002–0.003) internally, or gr. $\frac{1}{60}$ (0.001) if used hypodermically.

CIMICIFUGA.

What is cimicifuga?

Cimicifuga is the *rhizome* and *roots* of C. racemosa, black snakeroot or cohosh (*Nat. Ord.* Ranunculaceæ), a common indigenous plant. It contains a *volatile oil*, to which its virtues are probably due. A crystalline principle has also recently been obtained from it. Its *effects* on the circulation are supposed to resemble those of digitalis, while it acts on involuntary muscular fibres similarly to ergot. Recently it has been said, however, that it is a direct depressant to the cardiac muscle or its ganglia. It depresses the reflexes and occasionally causes nausea and vomiting. Its action is mild and not well understood. It is also diuretic and expectorant. It has been *used* as a *cardiac tonic* in fatty heart, as a *diaphoretic* in *rheumatism*, as a *diuretic* in *dropsies*, as an expectorant in *chronic bronchitis*, and as an *antispasmodic* in *chorea*, in which disease it is sometimes of value, combined with tonics and laxatives. It is not often prescribed.

EXTRACTUM CIMICIFUGÆ FLUIDUM (*fluid extract of cimicifuga*), *dose f℥ss–j (2.0–4.0).*

Tinctura Cimicifugæ (*tincture of cimicifuga*), dose fʒss–ij (2.0–8.0).

Extractum Cimicifugæ (*extract of cimicifuga*), dose gr. iij–v (0.2–0.3).

CONVALLARIA.

What is convallaria?

Convallaria is the *rhizome* and *roots* of C. majalis, or lily of the valley (*Nat. Ord.* Liliaceæ), a European plant naturalized in this country.

It contains two glucosides, *convallamarin* and *convallarin*, to the former of which it probably owes its action on the heart, while the latter appears to cause nausea, diarrhœa and gastric pain.

The results of the investigations regarding the *physiological action* of this plant are very contradictory, but it seems to slow the heart and increases the blood-pressure in small doses. In toxic doses the cardiac action becomes rapid, the arterial pressure gradually falls, and death occurs from heart-failure.

It is *used* in all cases of *cardiac weakness* whether accompanied by valvular lesion or not, as in *dilatation* or *fatty heart*. It is also used in *palpitation*.

Extractum Convallariæ Fluidum (*fluid extract of convallaria*), dose ♏v–xv (0.3–0.9).

ORDER II.—Cardiac Sedatives.

What are cardiac sedatives?

Cardiac sedatives are medicines which are used to diminish the force and frequency of the cardiac contractions when they are morbidly increased, and thus to depress the circulation.

Name the principal cardiac sedatives.

Antimonials, aconite and its alkaloid, veratrum viride and its alkaloids, veratrine, gelsemium, pulsatilla, arnica, the vegetable acids.

ANTIMONIUM—ANTIMONY.

What are the sources of antimony?

Antimony is a metallic element found native in the form of black antimonious sulphide.

Mention some of the tests for antimony.

Sulphuretted hydrogen in solution forms with solutions of antimonial salts an orange-colored precipitate. The metal should also be reduced by Marsh's test, and chemically and microscopically distinguished from arsenic.

What are the general physiological effects of antimonials?

When applied *locally* to the skin, the salts of antimony produce an eruption of papules, which become pustules, somewhat resembling the eruption of smallpox. After prolonged use, the fauces sometimes present a similar eruption. *Internally*, in *small doses*, they are diaphoretic. In somewhat *larger doses*, they cause nausea, depressed circulation, weakness, and increase of the mucous and cutaneous secretions. In *large doses*, they prove emetic, with very weak pulse, great general depression and relaxation of the muscular system. In *poisonous doses*, they are gastro-intestinal irritants, causing emesis, catharsis with cramps in the extremities, and collapse, often resembling Asiatic cholera, and death from asthenia, sometimes preceded by tonic and clonic spasms.

Antimonials slow the *heart*, increase the duration of its diastole and diminish the force of its systole by direct depression of the cardiac functions; they lower the blood pressure partly by cardiac depression and partly by paralyzing the peripheral vaso-motor system. The pulse finally becomes rapid and very feeble, the pressure sinks almost to *nil* and the heart is arrested in diastole. They depress and paralyze the reflex, sensory, and, to a less extent, the motor functions of the *spinal cord*. The *temperature* is reduced by poisonous doses. The *emesis* is probably partly from local and partly from centric irritation.

When *given for a length of time*, they cause fatty degeneration of various viscera.

Antimony is *eliminated* by the mucous membranes, especially of the stomach, by the liver, kidneys and skin.

What is the treatment of poisoning by antimony?

Wash out the stomach to remove any poison present; give tannic acid as a chemical antidote, and opium and stimulants to overcome the resulting depression.

What are the medicinal uses of antimonials?

They are used as *cardiac sedatives* in the early stages of *acute sthenic inflammations*, but are probably inferior to aconite or veratrum viride for this purpose. They are very useful in the early stages of *acute bronchitis* and in *acute laryngitis* from their combined sedative, diaphoretic and expectorant qualities. As *diaphoretics* they are used in minute doses, frequently repeated, in fever mixtures, or combined with minute amounts of morphine, which increases their action. The depression which they produce should always be remembered.

As *nauseants* and *emetics* they are rarely resorted to, because of the great depression which they produce.

Sulphurated antimony, or the old Kermes mineral, is sometimes used as a nauseant in membranous croup.

Locally, as a *counter-irritant* it is rarely employed.

What are the antimonial preparations?

ANTIMONII ET POTASSII TARTRAS (*antimonium and potassium tartrate—tartar emetic—tartarated antimony*); dose, *as a sedative*, gr. ¼–½ (0.01–0.03), increased to gr. j–ij (0.06–0.12), as tolerance to its action is established; as a *diaphoretic* and *expectorant*, gr. $\frac{1}{16}$–¼ (0.004–0.016), in solution, repeated every 2 or 3 hours until the desired results are produced; as an *emetic*, gr. j–ij (0.06–0.13).

VINUM ANTIMONII (*wine of antimony*) contains 4 parts of tartar emetic in 1000 of the preparation (about gr. ij–f℥j). Dose as a *diaphoretic* and *expectorant* ♏x–xxx (0.6–2.0); as an *emetic* fʒj–iv (4.0–15.0).

SYRUPUS SCILLÆ COMPOSITUS (*compound syrup of squill—Coxe's hive syrup*) contains tartar emetic, 2 parts in 1000 of the preparation (about gr. j to the f℥j). It is used in croup as an *emetic* and also as an *expectorant;* dose ♏v–fʒj (0.3–4.0).

The following preparations are somewhat uncertain, and are rarely employed:—

ANTIMONII OXIDUM (*antimonious oxide*), dose gr. j–ij (0.06–0.13).

PULVIS ANTIMONIALIS (*antimonial powder—James' powder*) contains antimonious oxide 33 per cent. with precipitated calcium phosphate; dose gr. iij–x (0.2–0.6).

Antimonii Sulphidum (*antimonious sulphide*) and Antimonii Sulphidum Purificatum (*purified antimonious sulphide*) are used in making the other preparations.

Antimonii Sulphuratum (*sulphurated antimony—Kermes mineral*), dose gr. j–iij (0.06–0.2); as an *emetic* gr. v–x (0.3–0.6).

Pilulæ Antimonii Compositæ (*compound pills of antimony—Plummer's pill*). Used as an alterative. Each pill contains of calomel and sulphurated antimony each gr. $\frac{6}{10}$ (0.04).

ACONITUM—ACONITE.

What is aconite, and what is its chemical composition?

Aconite is the *tuber* of Aconitum Napellus, aconite, monkshood or wolfsbane (*Nat. Ord.* Ranunculaceæ), a native of the mountains of Europe and Asia. The active principle is an alkaloid called *aconitine*. Other alkaloids have been discovered in it, viz.: *aconine*, *isaconitine*, and *picraconatine*.

What are its physiological effects?

Locally applied, aconite or aconitine benumbs the sensory nerves and causes a sensation of tingling. *Internally* in *small doses* it lessens the force and frequency of the cardiac contractions, diminishes the blood pressure, causes tingling in the lips, tongue and extremities and produces a feeling of weakness. When *large doses* are taken, these symptoms are more marked, the pulse becomes very weak and slow, a tendency to fainting is manifested on assuming the erect posture or on any exertion, and the respirations are reduced in number. After *poisonous* doses these symptoms are much intensified; the countenance is anxious, a cold sweat covers the body, the pulse and respiration are very slow, weak and irregular, general anæsthesia is present, and collapse and death from syncope, sometimes preceded by convulsions, occur.

Aconite affects the *heart* by directly depressing the cardiac muscle, and its contained motor ganglia. It probably also stimulates the cardio-inhibitory apparatus, but does not affect the vaso-motor nerves or centres. It paralyzes the peripheral end organs of both *motor* and *sensory nerves*, the latter being first affected by it, and the nerve trunks and centres being only involved as the poisoning deepens. The loss of reflex function is probably due to interference with conduction. It depresses and finally paralyzes the *respiratory centre.*

What is the treatment of poisoning by aconite?

Evacuate the contents of the stomach and wash it out by means of the stomach pump; keep the sufferer perfectly quiet, with his head low; give cardiac stimulants, as alcohol, ether or ammonia, and administer digitalis hypodermically.

What are the medicinal uses of aconite?

As a *cardiac sedative* aconite is of great value in the early stages of all *acute inflammations* and all *fevers*, in which the patient is vigorous and young and the pulse tense, full, bounding and strong, and is only *contraindicated* when the heart is weak, when there is gastro-enteric inflammation, or where a typhoid condition is present. Thus it is used to diminish the circulation, arterial tension and temperature, and to promote diaphoresis and diuresis in the sthenic forms of *surgical fever*, in *acute coryza*, acute *broncho-pulmonary* catarrhs, *acute pleuritis* and *acute peritonitis*, in *acute meningitis* either cerebral or spinal, and in the *essential fevers*, when not of the asthenic type. In *scarlet fever* and in *measles* (when the temperature is high), it is of great value, and is often used during the exacerbations of remittent malarial fevers. In *lobar pneumonia* veratrum viride is a safer remedy, but aconite will prove very serviceable if employed with great caution before consolidation has taken place.

In *cardiac hypertrophy* uncomplicated by valvular lesion, or even if the latter is present, provided the hypertrophy be in excess of the requirements of the system, it is an invaluable medicine.

As a *local anæsthetic* it has been advantageously given internally and applied externally in *neuralgia*, particularly of the face and head, and has been used locally in *chronic muscular rheumatism* and in *rheumatic neuralgiæ*.

What are the preparations of aconite and their doses?

Extractum Aconiti (*extract of aconite*), dose gr. ⅛–ss (0.008–0.03).

Extractum Aconiti Fluidum (*fluid extract of aconite*), dose ♏ss–ij (0.03–0.123).

Tinctura Aconiti (*tincture of aconite*), dose ♏j–v (0.06–0.3), frequently combined with other medicines in fever mixtures.

In fevers and inflammations aconite is preferably given in small doses, repeated every few hours, and carefully watched, until its effects on the pulse are obtained.

Aconitine is not official and should not be used internally, as even in the minutest doses it is a powerful poison. Duquesnel's aconitine has, however, been administered with great care in *tic douloureux* with success. Dose gr. $\frac{1}{300}$–$\frac{1}{200}$ (0.0002–0.0003). Morson's aconite is probably even more powerful. Aconitine is used *locally* as an anodyne in neuralgia, in the form of liniment (gr. ij (0.13)–fʒj (4.0)) or as an addendum to ointments.

VERATRUM VIRIDE.

What is veratrum viride, and what does it contain?

It is the *rhizome and roots* of Veratrum viride, American or swamp hellebore or Indian poke (*Nat. Ord.* Liliaceæ), a plant indigenous to swampy places in the eastern part of the United States. It contains two alkaloids, *veratroidine* and *jervine*, to which its effects are due; also *rubijervine*, *pseudojervine*, resin, etc.

What are their physiological effects?

Jervine taken *internally* causes great weakness, depresses the spinal cord and lowers reflex action, lessens the force and frequency of the heart by direct action on the cardiac muscle or its contained motor ganglia, greatly reduces the blood pressure, both by its action on the heart and by depressing and finally paralyzing the vaso-motor centres, causes profuse salivation, and death from asphyxia, preceded by convulsions of cerebral origin.

Veratroidine gives rise to the same general effects, but in addition always produces vomiting and often purging. When directly applied to the heart muscle, it paralyzes it. Given internally, it first slows the heart and lowers the blood pressure by stimulating the vagus, then, the pulse remaining slow, the heart beats increase in force and the blood pressure rises to normal, but suddenly, from peripheral paralysis of the vagi, the cardiac action becomes very rapid and diminishes in force, and, as asphyxia increases, the arterial tension is much elevated. Death is due to paralysis of the respiratory muscles.

Veratrum viride combines the effects of its alkaloids, and is a *powerful arterial* and *spinal* depressant [illegible] the frequency and force of the cardiac contractions, by depressing the heart muscle and stimulating inhibition, and lowering the blood pressure by paralyzing the vaso-motor system. It often causes vomiting. It is a diaphoretic, reduces the temperature, and sometimes proves diuretic. Poisoning rarely occurs, as an overdose causes emesis. Should dangerous symptoms arise, they should be treated with alcoholic and other cardiac stimulants.

What are the medicinal uses of veratrum viride?

It is given as a *cardiac sedative* in the same *inflammatory* and *cardiac affections* in which aconite is administered, and its *contra-indications* are identical with those of the latter drug, with the addition that in peritonitis it is not a safe remedy, because of its liability to cause vomiting. In *acute lobar pneumonia* it is considered much safer than aconite. In *acute mania* and in *mania-a-potu* (when the patient is strong and the pulse full and bounding), it is a valuable medicine, but should never be given in delirium tremens. It has been highly recommended in *puerperal eclampsia*, in doses of ♏x–xx (0.6–1.2) of the tincture, given hypodermically, partly as an arterial sedative and partly as a reflex depressant.

What are its preparations and their doses?

EXTRACTUM VERATRI VIRIDIS FLUIDUM (*fluid extract of veratrum viride*), dose ♏j–iv (0.06–0.24).

TINCTURA VERATRI VIRIDIS (*tincture of veratrum viride*), ♏ij–x (0.123–0.6).

Its effects are better obtained by giving small and increasing doses at intervals of an hour, being careful not to cause vomiting, and closely watching the pulse.

VERATRINA—VERATRINE.

What is veratrine?

Veratrine is a *mixture of alkaloids* obtained from the seed of Asagræa officinalis (*Nat. Ord.* Liliaceæ), a Mexican plant.

How may its presence be detected?

When warmed in concentrated hydrochloric acid a persistent dark-red color is produced, resembling a strong solution of potassium *permanganate*. This is *Trapp's test for veratrine*.

What are its physiological actions?

Locally veratrine is irritant, causing heat and pain, followed by numbness, and if long applied, redness of the surface. After *small doses* the pulse is weakened and reduced in frequency. *Large doses* are followed by vomiting and purging and muscular weakness; with cold, clammy skin; weak, rapid, irregular pulse and muscular tremors. Veratrine appears to stimulate the excito-motor *cardiac ganglia and muscle* (temporarily increasing the pulse), but soon depresses, and finally paralyzes them. It excites and then destroys the function of the vagi (thus lessening the pulse-rate, which, however, in poisoning, become rapid again as the vagi are paralyzed). The *vaso-motor centres* are first stimulated, then depressed. It first stimulates and then depresses the nerve trunks (or their peripheral end-organs) and the muscles, without apparently affecting the cerebrum or spinal cord. It depresses and finally paralyzes the respiratory centre, death occurring from this cause. The temperature is also lowered. It is eliminated chiefly by the skin and kidneys, increasing their secretion.

No fatal case of poisoning is recorded; the treatment is the same as that employed in poisoning by veratrum viride.

What are its therapeutic uses and preparations?

Although it has been used as a cardiac depressant, yet as it is inferior in this respect to the remedies already considered, it is now but little given *internally*. It is chiefly used as an external application in *rheumatic pains* and in *neuralgia*.

UNGUENTUM VERATRINÆ (*ointment of veratrine*) contains 4 per cent. of veratrine.

OLEATUM VERATRINÆ (*oleate of veratrine*) contains 2 per cent. of veratrine.

GELSEMIUM.

Is gelsemium used as a cardiac sedative?

It has been employed for this purpose in sthenic inflammation and fevers. Its medicinal uses have been described among the depresso-motors.

PULSATILLA.

What is pulsatilla?

It is the *herb* of Anemone pulsatilla and A. pratensis (*Nat. Ord.* Ranunculaceæ), and contains a volatile oily substance which when kept decomposes, forming *anemonin* and *anemonic acid.*

What are its effects and uses?

Locally pulsatilla is irritant; *internally* it depresses the circulation and lowers the blood-pressure, and in poisonous doses causes vomiting and purging, dilated pupils, convulsions, paralysis, diminished sensation, coma and death. It is *eliminated* by the kidneys. Pulsatilla is not much *used*, as it is decidedly inferior to other cardiac sedatives. It may be given in *doses* of gr. j–v (0.065–0.324) in powder, pill, capsule or infusion, or a tincture or fluid extract may be prepared.

ARNICA.

What is arnica?

It is the *flower-heads* and the *rhizome and roots* of Arnica montana, leopard's bane (*Nat. Ord.* Compositæ). It contains *arnicin*, a *volatile oil*, *resins*, etc.

What are its effects and uses?

Locally applied arnica is a stimulant and often a decided irritant. *Internally* it slows the heart, but seems to raise the arterial pressure slightly. In large doses it is emetic and cathartic, causes great muscular weakness, a rapid pulse, and if the dose be excessive, collapse. It seems to be eliminated by the skin and kidneys. Arnica is not much *used* in this country except as an *external* application to sprains and contusions. When thus employed its irritant qualities should be borne in mind. The preparations are:—

EXTRACTUM ARNICÆ RADICIS (*extract of arnica root*), dose gr. v–x (0.324–0.648).

EXTRACTUM ARNICÆ RADICIS FLUIDUM (*fluid extract of arnica root*), dose ♏x–xx (0.6–1.2).

TINCTURA ARNICÆ RADICIS (*tincture of arnica root*) and TINCTURA ARNICÆ FLORUM (*tincture of arnica flowers*), dose ♏x–xxx (0.6–2.0).

EMPLASTRUM ARNICÆ (*plaster of arnica*).

THE VEGETABLE ACIDS.

Name the vegetable acids.

The officinal vegetable acids are: acetic, citric and tartaric acids.

What are their general effects and uses?

When applied to an abraded surface they are irritant (tartaric acid being most, and citric the least, powerful). Given *internally* they increase the saliva and thus diminish thirst in fever. In *large doses* they are gastro-intestinal irritants and cardiac sedatives. They are probably oxidized in the blood and converted into carbonic acid, which by abstracting part of the base of the alkaline phosphates, converts them into acid phosphates, thus increasing the acidity of the urine. When taken in large quantities they cause flatulence, tormina and diarrhœa. Their long-continued use disorders the digestion, and causes emaciation and an anæmic condition. They are eliminated, chiefly as carbonates, by the intestines and kidneys.

The vegetable acids are *used* as *refrigerants* and perhaps cardiac sedatives in *fevers* (citric acid), as *antiscorbutic agents* (citric or acetic acid), in *acute rheumatism* (lemon juice is, however, inferior to the alkaline treatment), in *indigestion* depending on superacidity of gastric juice (lemon juice before meals), and as *diuretic* to increase the amount of urine, and render it acid in reaction (tartaric or citric acid).

They are also used as *chemical antidotes* to poisoning by the alkalies.

Locally acetic acid is used as a *caustic* to remove corns and warts, as a stimulating liniment in *sprains*, as an injection in *vaginal leucorrhœa*, and diluted with water it is given per rectum to *destroy ascarides*, and as a cooling lotion in fevers. The preparations are—

ACIDUM ACETICUM GLACIALE (*glacial acetic acid*) (nearly or quite absolute acetic acid) and ACIDUM ACETICUM (*acetic acid*) (containing 36 per cent. by weight of absolute acetic acid) are used externally as caustics.

ACIDUM ACETICUM DILUTUM (*diluted acetic acid*) may be used internally; dose fʒj–ij (4.0–8.0) diluted. It is a pure form of vinegar.

ACIDUM CITRICUM (*citric acid*), ℥j (31.0) to water Oj (480.0), may be used as a substitute for lemonade.

SYRUPUS ACIDI CITRICI (*syrup of citric acid*) contains 10 parts of the acid in the 1000 of the preparation.

LIMONIS SUCCUS (*lemon-juice*), OLEUM LIMONIS (*oil of lemons*), and SPIRITUS LIMONIS (*spirit of lemon—essence of lemon*) are also official.

ACIDUM TARTARICUM (*tartaric acid*) is rarely used in medicine, except as an ingredient of Seidlitz powders.

(C) ON THE SEXUAL ORGANS.

ORDER I.—APHRODISIACS.

What are aphrodisiacs?

Aphrodisiacs are medicines used to excite the functions of the genital organs when they are morbidly depressed.

What medicines are used for this purpose?

When the *nutritive functions are not properly performed*, the tonics or alteratives, especially phosphorus, zinc phosphide, the phosphates and hypophosphites, the salts of iron, gold or arsenic, and cod-liver oil are used. When there is *an absence of sexual desire*, small doses of opium, very minute amounts of alcohol, cannabis Indica, musk, or small doses of camphor may be useful by stimulating the cerebral centres. If impotence be due to *want of erectile power*, the tonics and alteratives are of use, as are also agents acting on the genital centre in the lumbar portion of the spinal cord and agents which either determine a flow of blood to the part by increasing the general or local circulation or which, by contracting the veins, aid in producing and maintaining erection. Thus, nux vomica or its alkaloid, the cardiac stimulants, hamamelis, ergot, cantharides and myrrh are useful in this condition. Good hygiene, cold baths, proper food and sea air and bathing, electricity, and moral means are important. The above medicines have either been considered already or will be found in their appropriate places.

ORDER II.—ANAPHRODISIACS.

What are anaphrodisiacs?

Anaphrodisiacs are medicines which are used to depress the sexual functions when they are morbidly excited.

What medicines are employed for this purpose?

Morbid excitation of the sexual organs is treated by medicines which depress the functions of the body generally, as nauseants and purgatives, or those which, by depressing the brain or spinal cord, will prove sedative to centres governing these organs: thus full doses of opium or of camphor will depress the cerebral centre, while potassium or ammonium bromide (very useful), monobromated camphor, iodine and the iodides, potassium nitrate, ammonium chloride, belladonna, tobacco, and conium act more especially on the spinal centre and nerves. Medicines diminishing the circulation of the parts will also prove advantageous, as the cardiac sedatives or full doses of digitalis and the bromides. Cocaine locally applied acts by contracting the vessels and diminishing the secretions of the sensory nerves.

Other agents used for this purpose are the local use of cold, general blood-letting, a low diet, avoidance of stimulation, and the withdrawal of blood to other parts of the body, as by hard mental work or exercise with the upper extremities.

ORDER III.—OXYTOCICS.

What are oxytocics?

Oxytocics are medicines which are employed to increase the power of a contracting uterus, thus aiding in the expulsion of its contents.

Name the medicines belonging to this order.

Ergot; hydrastis; hydrastinine hydrochlorate; gossypii radicis cortex, and quinine.

ERGOTA—ERGOT.

What is ergot?

Ergot is the *sclerotium* of Claviceps purpurea (*Nat. Ord.* Fungi), replacing the grain of Secale cereale (*Nat. Ord.* Graminaceæ), or, *in other* words, it is a fungus growing from the diseased ovary of *rye.* *“When more than a year old [illegible] unfit for use.”*

What does it contain?

The exact chemical composition of ergot is still a matter of doubt, but the latest researches seem to show that it contains a resinoid substance, *sphacelinic acid*, and a neutral principle, *cornutin*, which together represent the value of the drug.

What are its physiological effects?

The effects of ergot are chiefly manifested on the uterus of the pregnant female and on the circulation. In the *non-pregnant*, *small doses* produce no perceptible effect; *moderate doses* slow the heart, probably by stimulating the peripheral fibres of the vagi, and enormously increase the blood pressure by stimulating the vaso-motor centres. *Large doses* cause nausea and vomiting, increased peristalsis and purging. *Toxic doses* depress the heart by acting directly on its muscle or contained ganglia, and lower the blood-pressure, partly by its action on the heart and partly from depression of the vaso-motor centres.

When *poisonous doses are given to animals*, there is salivation, vomiting and sometimes diarrhœa, rapid pulse and respiration, dilated pupil, trembling, great thirst, prostration, paraplegia, convulsions and death. The nervous symptoms appear to be due to action on the nerve centres.

Ergot possesses the property of causing contraction of all non-striated muscular fibres: thus it contracts the arterioles, increases intestinal peristalsis, and increases the power as well as the duration of the uterine contractions during labor, but does not always originate them during pregnancy or at other times, except immediately prior to and after parturition.

What is ergotism?

When ergot is used continuously in large amounts as an article of diet, it produces a condition of chronic poisoning, which manifests itself either by gangrene (usually dry, but occasionally moist and attended with septicæmia) or by tetanic spasms.

What are the medicinal uses of ergot?

Ergot is used *as an oxytocic* in *small doses* in *uterine inertia* during the second stage of labor, when there is no resistance either on the part of the bony canal or the soft parts of the mother. When thus administered, it energizes the uterine contractions, but if given in large doses it renders them tetanic and continuous, thus greatly increasing the danger both to the mother and child.

To prevent *post-partum hemorrhage* by contracting the uterus, and thus compressing the uterine sinuses, it is invaluable, but had better be withheld until the placenta has left the uterine cavity, as prior to this it will tend to imprison the placenta by contracting the cervix. After the uterus is empty, it may be given in full doses, either by the mouth or hypodermically.

It has been used to *induce premature labor*, but is at best an uncertain remedy for this purpose. To arrest hemorrhage in cases of *threatened abortion*, ergot is worse than useless, unless the uterus is emptied. In these cases, by contracting the cervix, it imprisons the ovum, and thus, by preventing its escape, keeps the uterus distended. If given at all in these cases, its administration should be conjoined with the application of vaginal tampons. It is also given to aid the expulsion of *uterine polypi.*

As a hæmostatic, it is used in all *hemorrhages* where surgical means of arrest cannot be employed, and is often given as an adjuvant to their local treatment. In *menorrhagia*, *epistaxis*, *hemorrhage from the gums*, and in *broncho-pulmonary*, *intestinal* or *renal hemorrhage* it is very efficient. In *hæmatemesis*, it is not so serviceable. In *purpura*, it acts beneficially. From its influence in contracting blood vessels, it has been used in the early stages of *pneumonia* and other *inflammatory affections*, in *spinal congestions*, in *cerebro-spinal meningitis*, and for the cure of *internal aneurisms.* It has been injected hypodermically near the seat of disease for the cure of *varices*, *hemorrhoids*, and *impotence* due to dilatation of the dorsal vein of the penis. It may be employed with great advantage, either internally or hypodermically, to reduce the size of an *enlarged spleen.* In *glycosuria* and in *polyuria* it does good, and, from its influence on unstriped muscular fibres generally, it is useful in *relaxation of the sphincters*, *diarrhœa*, *dysentery*, *spermatorrhœa*, *uterine subinvolution*, and to diminish the size of *subperitoneal uterine fibroids.*

What are the preparations of ergot and their doses?

EXTRACTUM ERGOTÆ (*extract of ergot*) is five times as strong as the fluid extract; dose gr. v–xv (0.3–1.0). It may be used hypodermically, dissolved in water and filtered.

Extractum Ergotæ Fluidum (*fluid extract of ergot*), dose ♏v–f℥iv (0.3–15.0).

Vinum Ergotæ (*wine of ergot*) contains 15 per cent. of powdered ergot; dose f℥j–iv (4.0–15.0).

HYDRASTIS.

What is hydrastis?

Hydrastis is the *rhizome and roots* of H. canadensis, yellow root or golden seal (*Nat Ord.* Ranunculaceæ). It has been already considered under the Bitter Tonics (*q. v.*).

HYDRASTINÆ HYDROCHLORAS—HYDRASTINE HYDROCHLORATE.

What is this substance?

It is the hydrochlorate of an artificial alkaloid produced by the oxidation of hydrastine, and has been found to produce powerful uterine contractions, stimulating also the muscular fibres of the heart, arterioles, and intestines. It probably stimulates the voluntary muscles, but in a lesser degree.

In fatal doses it depresses powerfully the entire motor nervous tract and causes death by respiratory failure.

It has been used with success in menorrhagia and metrorrhagia and other uterine hemorrhages.

It is also recommended as a heart tonic. Dose gr. ¼–j (0.016–0.065).

GOSSYPII RADICIS CORTEX—BARK OF COTTON ROOT.

What is gossypii radicis cortex?

It is the *bark of the root* of Gossypium herbaceum and other species of Gossypium (*Nat. Ord.* Malvaceæ).

Given to animals, it first slows and then quickens the cardiac action, which is always enfeebled by first stimulating and then paralyzing the cardio-inhibitory apparatus and depressing the cardio-motor ganglia. It stimulates and then depresses the vaso-motor centres, causing a rise, but subsequently a fall, in the blood pressure. It stimulates non-striated muscular fibres, and appears to excite rhythmical contractions of the gravid uterus and to increase their power when present. It depresses the reflex centres of the cord, and causes death by respiratory paralysis, generally preceded by convulsions, which are not of cerebral origin.

It has been *recommended* as a substitute for ergot in *uterine inertia*, *post-partum hemorrhage*, and to aid the expulsion of *uterine myomata.* It has been used in *chronic metritis*, and although not as efficient as ergot, is useful in *menorrhagia.*

EXTRACTUM GOSSYPII RADICIS FLUIDUM (*fluid extract of cotton root*), dose f℥ss–j (2.0–4.0).

QUININA—QUININE.

Is quinine oxytocic?

Although quinine is used for this purpose, it probably posseses no action on the uterus *per se*, but as an antiperiodic or as a tonic, is capable of overcoming the morbid conditions (as malaria) which, by depressing the system at large, may prevent normal, healthy uterine contractions.

ORDER IV.—UTERINE SEDATIVES.

What are uterine sedatives?

They are medicines which are employed to depress the uterine muscular or nervous apparatus and restrain violent, irregular or untimely uterine contractions.

What medicines are used for this purpose, and when are they employed?

They are principally useful during pregnancy, to prevent abortion which is threatening, but not inevitable. They are also of service in arresting the irregular uterine contractions which sometimes occur prior to labor, and are called "false labor pains." For the former purpose opium, cannabis indica and the motor depressants—as chloral, the bromides, tartar emetic and viburnum prunifolium, especially the first- and last-named remedies—are used, while for the latter opium and chloral are employed. To moderate too violent contractions during labor, ether is the best remedy. **Of** *these medicines all* have been described except

VIBURNUM PRUNIFOLIUM.

What is viburnum prunifolium?

It is the *bark* of V. prunifolium, sloe or black haw (*Nat. Ord.* Caprifoliaceæ), a small indigenous tree. It *contains valerianic acid*, a bitter principle (*viburnin*), resin, tannin, etc. Its *physiological effects* are not understood. It appears to diminish reflex irritability and to have a sedative effect on involuntary muscular fibre and possibly lowers blood-pressure. Toxic effects are only seen after enormous doses have been administered, and consist of headache, dryness of the mouth and throat, and disordered vision.

It has been employed as a *uterine sedative* in *habitual* and in *threatened abortion*, in congestive and neuralgic *dysmenorrhœa*, in *menorrhagias* and in *nervous disturbances occurring at the climacteric* period, in *post-partum dolores* when no clots or fragments of the placenta remain in the uterus, and in *false labor-pains*. It has also been used in *colicky diarrhœa and dysentery*, and is even recommended for *cramps occurring in the voluntary muscles*.

Extractum Viburni Fluidum (*fluid extract of viburnum*), dose fʒss–ij (2.0–8.0) in elixir of orange.

ORDER V.—EMMENAGOGUES.

What are emmenagogues?

Emmenagogues are medicines employed to increase or reëstablish the menstrual flow when it is scanty or suppressed from other causes than pregnancy or the climacteric period.

When the catamenia are arrested from pregnancy, medicines used to bring them on cannot but be injurious to the woman, as the doses necessary are sufficient to cause poisoning, one of the symptoms of which may (or may not) be uterine hemorrhage. This is especially true of cantharides and of the volatile oils.

What medicines are used as emmenagogues?

When amenorrhœa depends upon anæmia or chlorosis the best emmenagogues are iron (combined with aloes or myrrh), arsenic or manganese. When local anæmia or an atonic condition of the uterus is present, aloes (*q. v.*) is very useful. If, on the other hand, pelvic plethora exists with constipation and a scanty flow often of a thick black discharge accompanied with pelvic pain and fullness, the saline cathartics are employed.

In suppression of the menses from cold, aloes and potassium permanganate are usually more successful. In amenorrhœa due to an atonic condition of the uterus, the more stimulating emmenagogues are given, generally with aloetic purgatives.

STIMULATING EMMENAGOGUES.

Name the stimulating emmenagogues.

Savine, tansy, apiol, cantharides and guaiac.

SABINA—SAVINE.

What is savine?

Savine is the *tops* of Juniperus Sabina (*Nat. Ord.* Coniferæ), a small evergreen shrub of Southern Europe. It contains a *volatile oil.* When applied *locally* savine is irritant. In *medicinal doses* it increases the circulation, is a gastric, uterine and renal irritant, and proves diuretic. In overdoses it is a gastro-intestinal irritant with great depression, unconsciousness, convulsions, hemorrhages from the uterus and kidneys, suppression of urine and, in pregnant females, abortion. Death occurs from collapse. Savine is *used* in relaxed states of the uterus and uterine vessels, and has proved successful in the treatment both of *amenorrhœa* and *menorrhagia* when due to atonic condition of this organ.

EXTRACTUM SABINÆ FLUIDUM (*fluid extract of savine*), dose ♏v–x (0.3–0.6).

OLEUM SABINÆ (*oil of savine*), the best preparation for internal use; dose gtt. v–x (0.3–0.6), in capsules or emulsion, every 3 or 4 hours.

TANACETUM—TANSY.

What is tansy?

Tansy is the *leaves* and *tops* of Tanacetum vulgare (*Nat. Ord.* Compositæ). It contains a volatile oil and a bitter principle (*tanacetin*). It is a gastro-intestinal irritant and diuretic, and in large doses causes death from respiratory paralysis, preceded by epileptiform convulsions of cerebral origin, and unconsciousness. It is used as a stimulating emmenagogue, but is a very dangerous remedy. *The minimum* fatal quantity is unknown. Dose gr. x–xxv (0.6–1.5), *in infusion; of the oil,* ♏j (0.06) may be given.

APIOL.

What is apiol?

Apiol (not official), or parsley-camphor, is obtained from the volatile oil of the root of Petroselinum sativum (*Nat. Ord.* Umbelliferæ). It is very efficacious as a stimulating emmenagogue in *functional* and *anœmic amenorrhœa* and in *neuralgic dysmenorrhœa*, but is contraindicated in any condition of plethora. Dose gtt. iij–x (0.18–0.6) in gelatin capsules given morning and evening for 4 or 5 days before the expected menstrual period.

The French capsules or pearls usually contain gr. iij$\frac{9}{10}$ (0.25) of apiol.

CANTHARIDES—GUAIAC.

What are these substances?

Cantharides will be considered under "Irritants." The tincture is used as a stimulating emmenagogue, dose ♏iij–v (0.18–0.3), t. i. d., great care being taken to avoid strangury.

Guaiac has been considered with the "Alteratives."

(D) ON THE ALIMENTARY CANAL.

ORDER I.—EMETICS.

What are emetics, and how do they act?

Emetics are medicines which are given to induce vomiting. They may act either by directly irritating the stomach, thus causing expulsion of its contents in a reflex manner, when they are called *local emetics*, or by acting, after absorption, on the reflex centre of the medulla which governs emesis, when they are called *systemic emetics.* It does not always follow that a remedy is a systemic emetic because it causes vomiting when given hypodermically or per rectum, for it may be eliminated by, and produce irritation of, the gastric mucous membrane, thus exciting reflex vomiting.

For what purposes are emetics used?

Emetics are used (1) to unload the stomach; (2) to depress the circulatory system by inducing nausea (as in the early stages of bronchitis or of tonsillitis, in which emetics, frequently repeated in small doses, will sometimes arrest the inflammation); (3) to relax the muscular system and relieve spasm (as in spasmodic croup); (4) to promote secretion and excretion; (5) to expel foreign bodies or secretions from the air passages, and (6) as revulsives.

What are the contraindications to their employment?

They should never be employed in cases of cerebral or gastric inflammation, and should be used cautiously, if at all, in the latter stages of pregnancy, in hernia, or where great depression exists, as in the latter stages of capillary bronchitis or of croup.

Name the medicines employed as emetics.

The vegetable emetics are ipecac, apomorphine and mustard. The *mineral emetics* are zinc sulphate, copper sulphate, alum, turpeth mineral and tartar emetic.

IPECACUANHA—IPECAC.

What is ipecac, and what chemical principles does it contain?

Ipecac is the *root* of Cephaëlis Ipecacuanha (*Nat. Ord.* Rubiaceæ), a plant of Brazil. Its effects depend upon an alkaloid, *emetine*, which is combined with *ipecacuanhic acid.*

What are its physiological actions?

Locally applied, ipecac is an irritant, either to the skin or mucous membranes. Given *internally* in *small doses*, repeated, it increases the perspiration, saliva, bile, the secretions from the broncho-pulmonary and gastro-intestinal mucous membranes, and causes nausea. In sufficient amounts it greatly augments the secretions and induces vomiting, without much nausea or depression, no matter how exhibited, emesis being more rapid when it is taken by the mouth.

Toxic doses in animals depress the *respiration* and paralyze the *heart* directly. Post-mortem examination shows the mucous membranes of the stomach, intestines and lungs to be intensely congested. Sometimes, however, the lungs are almost exsanguine.

What are the medicinal uses of ipecac?

Ipecac is employed *as an emetic*, and is the safest remedy which *can be given for this purpose*, especially to children. It is particularly of service when it is desired to evacuate the contents of an overloaded stomach without producing much depression, as an adjunct to other remedies in *croup* and in the earlier stages of *capillary bronchitis*. In narcotic poisoning it is not as efficient as the mineral emetics.

As an *expectorant* it is added to cough medicines in the dry stage of bronchitis. As a *cholagogue* it is a valuable addition to purgative pills. As a *hæmostatic* it is highly recommended in *hæmoptysis* and *post-partum hemorrhage.*

In the treatment of *dysentery*, especially when epidemic, it is of great service, given in large dose (gr. xx–ʒij (1.28–8.0), every few hours). When thus administered a tolerance is soon established, and no nausea or vomiting is produced. It is also useful in various kinds of *diarrhœa*, especially of choleriform and tuberculous diarrhœa. *Reflex vomiting*, as the vomiting of pregnancy, has sometimes been arrested by minute doses of the wine of ipecac.

What are the preparations of ipecac and their doses?

Ipecac may be given in powder, dose as an *emetic* gr. x–xx (0.64–1.28); as a *nauseant*, gr. ss–ij (0.03–0.13); as an *expectorant* and *diaphoretic*, gr. $\frac{1}{4}$–$\frac{1}{2}$ (0.016–0.032); as a *stomachic tonic* and *hepatic stimulant*, gr. $\frac{1}{12}$–$\frac{1}{8}$ (0.005–0.008).

EXTRACTUM IPECACUANHÆ FLUIDUM (*fluid extract of ipecac*), dose as an emetic ♏xx–xxx (1.23–1.8), repeated until vomiting occurs.

VINUM IPECACUANHÆ (*wine of ipecac*) contains 10 per cent. of the fluid extract; dose as emetic fʒj–iv (4.0–16.0).

SYRUPUS IPECACUANHÆ (*syrup of ipecac*) contains 7 per cent. of the fluid extract; as an emetic fʒj–ij (4.0–8.0) may be given to a child, or ♏v–x (0.3–0.6) as an expectorant.

TROCHISCI IPECACUANHÆ (*troches of ipecac*), each contains about gr. $\frac{1}{8}$ (0.02) of ipecac.

Powder of ipecac and opium (Dover's powder), *tincture of ipecac and opium*, and *troches of ipecac and morphine* have been considered under "Opium."

APOMORPHINÆ HYDROCHLORAS—APOMORPHINE HYDROCHLORATE.

What is apomorphine hydrochlorate?

It is the *hydrochlorate* of an artificial alkaloid obtained from *morphine* or codeine.

What are its physiological actions?

Given to warm-blooded animals in *small doses* it causes vomiting; after *large doses* there is salivation, violent vomiting and muscular tremors; *toxic doses* induce great restlessness, paresis, convulsions, hurried respiration and death from asphyxia, without the occurrence of emesis.

It is a systemic emetic, probably in medicinal doses stimulating the reflex centre for *vomiting*, but in large doses depressing and paralyzing it. No matter how administered, emesis takes place promptly, with but little nausea and rarely accompanied by much depression. Large doses appear to stimulate and finally paralyze the respiratory centre. It increases the *pulse-rate* by stimulating the accelerator fibres (?), and in large doses by stimulating the vasomotor centres, it raises the arterial pressure. In toxic doses it depresses the cardiac muscle and thus reduces the blood pressure. In large doses it is at first a *cerebral* stimulant, but later depresses and paralyzes the brain. The cause of the convulsion is not understood. It is a *muscle* poison.

What are the uses and doses of apomorphine hydrochlorate?

It may be employed *as an emetic* whenever prompt evacuation of the stomach is required, and may be administered either hypodermically or by the mouth. In *narcotic poisoning* it is highly recommended.

As an expectorant in the early stages of *acute bronchitis* or in *chronic bronchitis* without much expectoration, it is very serviceable, and can be advantageously used in *capillary bronchitis* of children both as an expectorant and emetic. The adult dose as an *emetic* is gr. $\frac{1}{16}$ (0.004) hypodermically, or gr. $\frac{1}{10}$–$\frac{1}{8}$ (0.005–0.008) by the mouth. As as *expectorant* smaller doses are required.

SINAPIS—MUSTARD.

What is mustard, and how is it used as an emetic?

Mustard is the *seed* of Brassica nigra and B. alba (*Nat. Ord.* Cruciferæ). Mustard flour is irritant to the mucous membranes as well as to the skin, and is a prompt and efficient local emetic, especially useful when torpor of the stomach is present. It will be more *fully considered hereafter.* Dose as an emetic from a teaspoonful to a tablespoonful (4.0–16.0) of the flour, in a glass of tepid water, repeated, if necessary, in 15 or 20 minutes.

What mineral emetics are employed?

Zinci Sulphas (*zinc sulphate*) is a prompt and efficient local emetic. Dose gr. x–xx (0.6–1.2), or even gr. xxx (1.9) in narcotic poisoning.

Cupri Sulphas (*copper sulphate*) is a prompt local emetic, but more irritating than the zinc salt. Dose gr. iij–v (0.10–0.3) or even gr. x (0.6) in narcotic poisoning. It is the best emetic in poisoning by phosphorus (*q. v.*).

Alumen (*alum*) is also a local emetic of value, especially useful in *membranous croup*, and useful also in *capillary bronchitis*; dose a teaspoonful (4.0) of the powdered drug in molasses, or, better, in syrup of ipecac.

Hydrargyri Subsulphas Flavus (*yellow mercurial subsulphate—Turpeth mineral*), used as an emetic in *croup*; dose gr. j–v (0.06–0.3) repeated every 10 or 15 minutes until free vomiting occurs.

Antimonii et Potassii Tartras (*antimonium and potassium tartrate—tartar emetic*) is rarely used as an emetic because of the great depression which it induces; dose gr. j–ij (0.06–0.13).

Of these substances the three first will be found under the head of astringents, while the two last have already been considered.

ORDER II.—Gastric Sedatives.

What are gastric sedatives?

They are medicines employed to diminish gastric irritability, and thus allay nausea and vomiting.

What medicines are used for this purpose?

When vomiting is due to *acute irritation*, as from an overloaded stomach, the ingestion of acrid substances, or cholera morbus, it is best treated, after the contents have been evacuated, by minute doses of calomel (gr. $\frac{1}{10}$ (0.005)) with sodium bicarbonate (gr. j (0.06)); pellets of ice dissolved in the mouth; lime-water and rest. A small dose of brandy will sometimes "settle the stomach." If *irritability persists*, small doses of morphine, or of diluted hydrocyanic acid or creasote, or bismuth and sodium bicarbonate answer better. When due to the formation of gases from *fermentation*, creasote, carbolic acid, thymol, sulphurous acid, the sulphites or charcoal are given.

When vomiting occurs on taking food after *long abstinence*, and perhaps *preceding irritation*, calomel and sodium bicarbonate in minute amounts, followed by small doses of brandy, and milk and lime-water by the teaspoonful (4.0) at intervals, should be employed. *Ether-vomiting* is best met with teaspoonful (4.0) doses of very hot water given every 10 or 15 minutes. *Reflex vomiting*, as of sea-sickness or of pregnancy, usually requires a medicine which will depress the centre in the medulla presiding over the act, as opium, the bromides, or diluted hydrocyanic acid. Among other remedies used for the latter variety of vomiting may be mentioned, tincture of nux vomica (gtt. ¼–j (0.015–0.06), cerium oxalate (gr. ¼–v (0.016–0.3)), wine of ipecac (gtt. ¼–ij (0.015–0.12)), and Fowler's solution (♏¼–j (0.015–0.06)). Counter-irritation over the epigastrium often aids the action of gastric sedatives. The above remedies have already been noticed or will be discussed in their appropriate places.

ORDER III.—CARMINATIVES.

What are carminatives?

Carminatives are medicines employed to aid the expulsion of gases from the stomach and intestines.

What medicines are used as carminatives?

The *aromatics*, which owe their virtues principally to the volatile oil which they contain, are especially used for this purpose. Other drugs containing volatile oils, as asafetida, eucalyptus, etc., are also carminative; and ether is sometimes employed for the same object.

What are the general effects of the aromatics?

Locally they are irritant and rubefacient. The oils are also local anæsthetics. *Internally* in *medicinal doses* they are gastric and intestinal stimulants, increasing peristalsis and temporarily increasing to a slight extent the force and frequency of the pulse. In *larger doses they* stimulate the brain and cause a species of intoxication. *In very large doses* they are irritant and narcotic poisons.

What are their medicinal uses?

The aromatics are used internally as *carminatives;* to prevent the *griping* of purgatives; to *correct* the unpleasant *taste* or *smell* of other medicines, and as *gastric stimulants.*

Locally they are employed as *rubefacients, antiseptics* and *anodynes.* They should *never be used* when inflammation of the stomach or bowels is present, but in diarrhœa due to relaxation they are often of service.

Name the aromatics, their chemical constituents, preparations and doses.

CAPSICUM, or red pepper, is the *fruit* of C. fastigiatum (*Nat. Ord.* Solanaceæ). It contains a *resin,* a *fixed* and a *volatile oil.* It is *used* as a *condiment,* as a *gastric stimulant,* particularly in the case of drunkards, as an addendum to tonic pills, as a *carminative* in cases of feeble digestion, as a gargle in tonsillitis, and externally as a *rubefacient.*

EXTRACTUM CAPSICI FLUIDUM (*fluid extract of capsicum*), dose ♏v–x (0.3–0.6).

TINCTURA CAPSICI (*tincture of capsicum*), dose ♏v–fʒj (0.3–4.0).

OLEORESINA CAPSICI (*oleoresin of capsicum*), dose gr. ss–j (0.03–0.06).

EMPLASTRUM CAPSICI (*plaster of capsicum*), for external use.

PIPER (*pepper*) is the *unripe fruit* of Piper nigrum (*Nat. Ord.* Piperaceæ). It contains a *volatile oil,* an acrid *resin* and a neutral principle, *piperin,* which increases the respiration and circulation, dilates the pupil, and finally paralyzes the heart in systole. It has been used as an *antiperiodic.* Pepper is used as a *condiment* and sometimes as a *stomachic stimulant,* combined with other medicines, in atonic dyspepsia, and as a *carminative.*

OLEORESINA PIPERIS (*oleoresin of pepper*), dose gr. ss–ij (0.03–0.13).

PIPERINUM (*piperin*), dose gr. j–v (0.06–0.3).

CINNAMOMUM CASSIA (*cassia cinnamon*), the *bark of the shoots* of one or more undetermined species of cinnamomum, grown in China (*Nat. Ord.* Laurineæ); CINNAMOMUM SAIGONICUM (*Saigon cinnamon*), *the bark* of an undetermined species of cinnamomum

(*Nat. Ord.* Laurineæ) (which comes from Cochin-China); and CINNAMOMUM ZEYLANICUM (*Ceylon cinnamon*), *the inner bark of the shoots of cinnamomum Zeylanicum* (*Nat. Ord.* Laurineæ), are all recognized by the Pharmacopœia. Of these varieties the latter is considered the finest and the former the poorest in quality. They contain *volatile oil*, *tannic acid*, etc., are slightly astringent, and are used as *carminatives*, *flavoring ingredients*, and *vehicles*.

TINCTURA CINNAMOMI (*tincture of cinnamon*) contains 10 per cent. of powdered Ceylon cinnamon; dose fʒj–ij (4.0–8.0).

AQUA CINNAMOMI (*cinnamon water*) contains 0.2 per cent. of the oil of cinnamon, and is used as a vehicle.

OLEUM CINNAMOMI (*oil of cinnamon*) is a volatile oil distilled from cassia cinnamon; dose gtt. j–iij (0.06–0.18).

SPIRITUS CINNAMOMI (*spirit of cinnamon*) contains 10 per cent. of the oil; dose ♏x–xxx (0.6–2.0).

MYRISTICA (*nutmeg*); MACIS (*mace*). These are parts of the *fruit* of Myristica fragrans (*Nat. Ord.* Myristicaceæ), the *arillode of the seed* being mace, and *the seed* nutmegs. Both contain volatile oils. They are aromatic stimulants, carminatives, and in large doses narcotics.

OLEUM MYRISTICÆ (*oil of nutmeg*), dose gtt. j–v (0.06–0.3).

SPIRITUS MYRISTICÆ (*spirit of nutmeg*) contains 5 per cent. of the oil; dose fʒss–ij (1.8–7.3).

CARYOPHYLLUS (*cloves*) is the *unexpanded flowers* of Eugenia aromatica (*Nat. Ord.* Myrtaceæ). They contain *volatile oil*, *tannic acid*, *caryophyllin* and *eugenin*. They are gastric stimulants and carminatives, but are principally employed as a condiment. The oil is used as a local anodyne to carious teeth.

OLEUM CARYOPHYLLI (*oil of cloves*), dose gtt. iij–v (0.18–0.3).

PIMENTA, or allspice, is the *nearly ripe fruit* of Pimenta officinalis (*Nat. Ord.* Myrtaceæ). It contains a *volatile oil*, and is carminative.

OLEUM PIMENTÆ (*oil of pimenta*), dose gtt. iij–v (0.18–0.3).

ZINGIBER (*ginger*) is the *rhizome* of Z. officinale (*Nat. Ord.* Scitamineæ). It contains a *volatile oil* and an acrid resin. It is a *gastric stimulant* and *carminative*, much employed in flatulency and colic and as an addition to other stomachics.

EXTRACTUM ZINGIBERIS FLUIDUM (*fluid extract of ginger*), dose ♏x–xxx (0.6–2.0).

TINCTURA ZINGIBERIS (*tincture of ginger*), dose fʒss–j (2.0–4.0).

SYRUPUS ZINGIBERIS (*syrup of ginger*), used as a vehicle for other medicines.

OLEORESINA ZINGIBERIS (*oleoresin of ginger*), used as a corrective to purgative pills to prevent griping; dose ♏ss–ij (0.03–0.12).

TROCHISCI ZINGIBERIS (*troches of ginger*), dose 2 or 3 lozenges.

CARDAMOMUM (*cardamom*) is the *fruit* of Elettaria repens (*Nat. Ord.* Scitamineæ), and contains a *volatile oil.* It is used as a gastric stimulant and carminative, and as an adjuvant and corrective of other medicines.

TINCTURA CARDAMOMI (*tincture of cardamom*), dose fʒj–ij (4.0–8.0).

TINCTURA CARDAMOMI COMPOSITA (*compound tincture of cardamom*) contains also caraway, cassia, cinnamon, and cochineal; dose fʒj–ij (4.0–8.0).

PULVIS AROMATICUS (*aromatic powder*) consists of ceylon cinnamon and ginger (35 per cent. each), with cardamom and nutmeg (15 per cent. each). An excellent carminative preparation. Dose gr. x–xxx (0.6–2.0).

EXTRACTUM AROMATICUM FLUIDUM (*aromatic fluid extract*) is a fluid extract of aromatic powder. Dose ♏xv–xxx (1.0–2.0).

OLEUM CAJUPUTI (*oil of cajuput*) is the *volatile oil* distilled from the *leaves* of Melaleuca Leucadendron (*Nat. Ord.* Myrtaceæ), and is very destructive to low organisms. It has been employed as a remedy against ascarides and, locally, in parasitic skin diseases, but is chiefly used as a gastric stimulant and carminative in flatulent colic and to prevent the griping of cathartics. Dose ♏j–v (0.06–0.3).

CALAMUS is the *rhizome* of Acorus Calamus (*Nat. Ord.* Aroideæ). It contains a *volatile oil* and a glucoside, *acorin.* It is an aromatic stimulant and is somewhat tonic.

EXTRACTUM CALAMI FLUIDUM (*fluid extract of calamus*), dose ♏x–xxx *(0.6–2.0).*

OLEUM GAULTHERIÆ (*oil of gaultheria*) is a *volatile oil* distilled from the *leaves* of G. procumbens or wintergreen (*Nat. Ord.* Ericaceæ), and has been considered under the head of "Salicylic Acid". It consists almost entirely of methyl salicylate and is nearly identical with volatile oil of Betula (*vid.* Salicylates); dose in rheumatism ♏v–xv (0.31–0.93 c. c.).

SPIRITUS GAULTHERIÆ (*spirit of gaultheria*) contains 5 per cent. of the oil; dose ♏x–xxx (0.62–1.85 c. c.).

The following herbs, belonging to the *Nat. Ord.* Labiatæ, contain volatile oils, and are used as carminatives, gastric stimulants and flavoring ingredients:—

OLEUM LAVENDULÆ FLORUM (*oil of lavender flowers*) is a *volatile oil* distilled from the *flowers* of L. vera. Dose gtt. j–v (0.06–0.3). *Spiritus Lavendulæ* (*spirit of lavender*) and *Tinctura Lavendulæ Composita* (*compound tincture of lavender*) are also official; dose of either f℥ss–j (2.0–4.0).

MENTHA PIPERITA (*peppermint*) and MENTHA VIRIDIS (*spearmint*). The *leaves* and *tops* are official. The *oils* (*oleum menthæ piperitæ* and *oleum menthæ viridis*, dose gtt. j–v (0.06–0.3)) are usually given in the form of *spirit* (*spiritus menthæ piperitæ* and *spiritus menthæ viridis*), dose ♏v–xxx (0.3–2.0). The *waters* (*aqua menthæ piperitæ* and *aqua menthæ viridis*) are used as vehicles. *Troches of peppermint* (*trochisci menthæ piperitæ*) are sometimes used in flatulent colic.

OLEUM ROSMARINI (*oil of rosemary*) is a *volatile oil* distilled from the *leaves* of Rosmarinus officinalis. It is carminative, but is chiefly used as an ingredient of rubefacient liniments.

HEDEOMA (*pennyroyal*). The *leaves* and *tops* of H. pulegioides are official. The *volatile oil* (*oleum hedeomæ*) may be given in doses of ♏j–v (0.06–0.3).

MARRUBIUM (*horehound*). The *leaves* and *tops* of M. vulgare are used as a gastric stimulant and expectorant.

SALVIA (*sage*). The *leaves* of S. officinalis are slightly astringent as well as aromatic. An infusion is sometimes used as a gargle in sore throat.

OLEUM THYMI (*oil of thyme*), a *volatile oil distilled* from the *leaves and flowering tops* of Thymus vulgaris, contains much *thymol* (*q. v.*), and is therefore not only aromatic and carminative, but antiseptic and antifermentative.

The following *seed* are derived from plants belonging to the *Nat. Ord.* Umbelliferæ:—

FŒNICULUM (*fennel*), from F. capillaceum. Of the *oil* (*oleum fœniculi*), the dose is gtt. v–x (0.3–0.6). A *water* (*aqua fœniculi*) is also official.

CARUM (*caraway*), from C. Carvi. Dose of the *oil* (*oleum cari*) gtt. j–x (0.06–0.6).

ANISUM (*anise*), from Pimpinella anisum. Dose of the *oil* (*oleum anisi*) gtt. v–xv (0.3–0.9). A *spirit* (*spiritus anisi*) and a *water* (*aqua anisi*) are also official.

CORIANDRUM (*coriander*), from C. sativum. The *oil* (*oleum coriandri*) is official.

ILLICIUM (*star-anise*) is the *fruit* of I. verum (*Nat. Ord.* Magnoliaceæ). It contains a volatile *oil*, and is used as a substitute for anise.

The following preparations are only used as flavors and vehicles:—

AURANTII AMARI CORTEX (*bitter orange peel*); AURANTII DULCIS CORTEX (*sweet orange peel*). These are respectively the *rind* of the *fruits* of Citrus vulgaris (bitter orange) and of C. Aurantium (sweet orange) (*Nat. Ord.* Rutaceæ). The following preparations are official:—

Oil of orange flowers, or oil of neroli (*oleum aurantii florûm*), a volatile oil distilled from the fresh flowers of the bitter orange; *stronger orange flower water* (*aqua aurantii florûm fortior—aqua aurantii florûm*, Pharm. 1880—*triple orange flower water*), water saturated with the volatile oil of fresh orange flowers, obtained as a by-product in the distillation of the oil of orange flowers; *orange flower water* (*aqua aurantii florûm*), equal volumes of stronger orange flower water and distilled water freshly mixed; *syrup of orange flowers* (*syrupus aurantii florûm*); *syrup of orange peel* (*syrupus aurantii*); *oil of orange peel* (*oleum aurantii corticis*); *spirit of orange* (*spiritus aurantii*); *compound spirit of orange* (*spiritus aurantii compositus*) contains oil of orange peel (200), oil of lemon (50), oil of coriander (20), and oil of anise (5) in 1000 parts of the preparation. It is used in making *elixir aromaticum* (*aromatic elixir*), which contains 12 parts of the compound spirit in 1000 parts of the preparation; *fluid extract of bitter orange peel* (*extractum aurantii amari fluidum*); *tinctures of bitter* and *of sweet orange peel* (*tinctura aurantii amari, tinctura aurantii dulcis*)—dose of either tincture, f℥j–ij (4.0–8.0).

VANILLA, the *fruit* of V. planifolia (*Nat. Ord.* Orchidaceæ), contains *vanillin.* The *tincture* (*tinctura vanillæ*) is official.

The *oil of turpentine* is an excellent carminative and will be considered hereafter.

ORDER IV.—CATHARTICS.

What are cathartics?

Cathartics are medicines employed to produce an evacuation from the bowels either by increasing intestinal peristalsis, or by increasing the secretions of the canal and its appendages.

For what purposes are they used?

They are used (1) to unload the bowels; (2) to deplete the blood vessels by abstracting water from the blood; (3) to promote absorption; (4) to stimulate secretion; (5) to eliminate noxious material from the blood (as the poison of uræmia); (6) to act as revulsives, and (7) to influence the pelvic circulation.

How may cathartics be classified?

Cathartics are divided into laxatives, simple purgatives, salines and drastics.

LAXATIVES.

What are laxatives?

Laxatives are such substances as unload the bowels, acting without irritation and not causing purgation.

Name the laxatives.

Tamarind, manna, cassia fistula, frangula, cascara sagrada, castor *oil, sulphur and sulphurated* potassa.

TAMARINDUS—TAMARIND. MANNA. VIOLA TRICOLOR.

What are these substances?

TAMARINDUS (*tamarind*) is the *preserved pulp of the fruit* of T. indica (*Nat. Ord.* Leguminosæ), a tree of India. Eaten as a preserve (℥ss–j (15.0–31.0)) it is laxative. An infusion makes a pleasant refrigerant drink. It enters into *confection of senna.*

MANNA is the *concrete saccharine exudation* of Fraxinus Ornus (*Nat. Ord.* Oleaceæ). It contains *mannit*, *fraxin*, and *resin* which is probably the laxative principle. Manna is usually combined with other cathartics. Dose for an adult ℥j–ij (31.0–62.0); for children, ʒj–iv (4.0–15.0).

CASSIA FISTULA. FRANGULA. RHAMNUS PURSHIANA.

What are these substances?

CASSIA FISTULA is the *fruit* of C. Fistula or purging cassia (*Nat. Ord.* Leguminosæ). It is an ingredient of the *confection of senna.* Dose ʒj–℥j (4.0–31.0).

FRANGULA is the *bark* of Rhamnus Frangula or alder buckthorn (*Nat. Ord.* Rhamneæ). It contains *frangulin* and *emodin*, and as it is an active emetic and hydragogue when fresh, it should be kept a year at least before being used; dose of the *fluid extract* (*extractum frangulæ fluidum*) fʒss–j (2.0–4.0).

RHAMNUS PURSHIANA (*cascara sagrada* or *chittem bark*) is the *bark* of R. Purshiana (*Nat. Ord.* Rhamnaceæ), a tree of California. It contains several resins and is an efficient laxative, very useful in habitual constipation; dose of the *fluid extract* (*extractum rhamni purshianæ fluidum*) ♏x–fʒj (0.6–4.0).

OLEUM RICINI—CASTOR OIL.

What is castor oil?

It is a *fixed oil* expressed from the *seed* of Ricinus communis, or Palmi Christi (*Nat. Ord.* Euphorbiaceæ).

What are its effects and uses?

In *small doses* it is a mild laxative, in larger amounts a simple purgative. Applied with friction to the abdomen of children it frequently purges. It is very useful whenever it is desired to evacuate the bowels and remove any irritant materials, as undigested food. For this purpose it is often used in acute dysenteries and diarrhœas, especially of children; dose fʒj–iv (4.0–16.0), best given in whiskey and water, in such a manner that the entire inside of the glass will be wetted to its margins with the vehicle and the oil form a globule surrounded by the fluid; or it may be given beaten up with double the quantity of sherry; or mixed with equal parts of glycerin and flavored with some aromatic oil.

SULPHUR.

What is sulphur?

Sulphur is a chemical element obtained by purifying native sulphur or by decomposing native sulphides.

What are its effects, uses and preparations?

It acts as a mild laxative and is eliminated in all the excretions. Its continued use causes flatulence from the formation of sulphuretted hydrogen. It is used as a *laxative*, especially in cases of *hemorrhoids*, and as an *alterative* both internally and externally in *chronic rheumatism*, *muscular rheumatism*, *sciatica*, and in various forms of *skin disease*, especially those of parasitic origin. As sulphur is excreted largely by the hair, it has been used locally and internally in the treatment of *alopecia*. It is also used as an *expectorant*. It is official as SULPHUR SUBLIMATUM (*sublimed sulphur*, sometimes called "flowers of sulphur"), SULPHUR LOTUM (*washed sulphur*), and SULPHUR PRÆCIPITATUM (*precipitated sulphur*); dose of either preparation, ʒj–iv (4.0–16.0) in syrup. UNGUENTUM SULPHURIS (*sulphur ointment*, containing 30 per cent. of washed sulphur) is used externally.

POTASSA SULPHURATA—SULPHURATED POTASSA.

What is sulphurated potassa?

Sulphurated potassa, or liver of sulphur, is an uncertain compound containing about 50 per cent. of potassium sulphide.

In *small doses* it is decomposed in the stomach and acts like *sulphur*. *In large doses* it is a gastro-intestinal irritant and has produced death. It may be *used* to fulfil the indications of sulphur, but is chiefly employed as an *alterative* where a tendency to the formation of abscesses exists, in chronic rheumatism and in scaly skin affections. It is used *externally* in the form of bath or ointment; dose gr. ij–x (0.1–0.6).

SIMPLE PURGATIVES.

What are the simple purgatives?

They are medicines employed to produce active purgation, but which do not produce sufficient irritation to cause inflammation or depression, even when large doses are given.

Name the agents of this group.

Castor oil, rhubarb, juglans, aloes, senna, leptandra, euonymus, and mercurials.

Castor oil has been described with the *laxatives*.

RHEUM—RHUBARB. JUGLANS.

What are these medicines?

Rhubarb is the *root* of Rheum officinale (*Nat. Ord.* Polygonaceæ). It contains *chrysophan*, *chrysophanic acid*, 4 resins (*erythroretin*, *emodin*, *phæretin* and *aporetin*), *rheotannic* and *rheumic acids*. It is a tonic, mild purgative, and an astringent owing to the rheotannic acid, and hence after purging it has a tendency to cause constipation. It tinges the milk and urine yellow, and stimulates the flow of bile. It is much used in *diarrhœa* from relaxation, in the early stages of *summer complaint* of children and in *dyspepsia* with constipation. The official preparations and their doses are: the *extract* (*extractum rhei*), gr. v–xx (0.3–1.3); *pills* (*pilulæ rhei*) each contain gr. iij (0.2) of rhubarb; *compound pills* (*pilulæ rhei compositæ*) each contain gr. ij (0.13) of rhubarb, gr. jss (0.1) of aloes, with myrrh and oil of peppermint; dose No. j–iv; *compound powder* (*pulvis rhei compositus*) contains rhubarb and magnesia, dose ʒss–j (2.0–4.0); *fluid extract* (*extractum rhei fluidum*), ♏xx–xxx (1.2–2.0); *mixture of rhubarb and soda* (*mistura rhei et sodæ*), for a child fʒss–j (2.0–4.0), for an adult fʒj–iv (4.0–16.0); *syrup* (*syrupus rhei*), ♏x–xx (0.6–1.2) for an infant; *aromatic* or *spiced syrup* (*syrupus rhei aromaticus*), for an infant fʒss–j (2.0–4.0); *tincture* (*tinctura rhei*), fʒj–ij (4.0–8.0); aromatic tincture (tinctura *rhei aromaticus*), fʒss–j (2.0–4.0); *sweet tincture* (*tinctura rhei dulcis*), fʒj–ij (4.0–8.0).

JUGLANS is the *bark* of the *root* of Juglans cinerea, butternut or white walnut (*Nat. Ord.* Juglandaceæ), collected in autumn. It is used as a substitute for rhubarb, which it resembles in action. The *extract* (*extractum juglandis*) may be given in doses of gr. x–xxx (0.6–2.0).

ALOE—ALOES.

What is aloes?

Aloes is the *inspissated juice* of the *leaves* of Aloe Perryi, socotrine aloes (*aloe socotrina*) and of Aloe vera, Barbadoes aloes (*aloe Barbadensis*) (*Nat. Ord.* Liliaceæ). Each variety contains a neutral crystalline principle, *aloin.* It is a tonic to the mucous membrane and a purgative, being slow in its action and affecting principally the large intestine, and apparently causing a determination of blood to the pelvic viscera. It is also a hepatic stimulant. It is *used* in habitual constipation, especially when torpor of the large bowel exists; in *hemorrhoids* from relaxation of the veins and congestion of the portal circle; in *amenorrhœa* and in *menorrhagia* due to want of tone of the uterine vessels. The official preparations are made of *purified* (socotrine) *aloes* (*aloe purificata*), and are, *pills* (*pilulæ aloes*), each containing gr. ij (0.13) of aloes; *pills of aloes and mastich* (*pilulæ aloes et mastiches*), called also *Lady Webster's dinner-pill*, each containing gr. ij (0.13) of aloes; *pills of aloes and myrrh* (*pilulæ aloes et myrrhæ*) or *Rufus' pill*, each containing gr. ij (0.13) of aloes; *pill of aloes and iron* (*pilulæ aloes et ferri*) each containing gr. j (0.07) of aloes, of dried ferrous sulphate and of aromatic powder (the two last named pills are useful in amenorrhœa); *pills of aloes and asafetida* (*pilulæ aloes et asafœtidæ*), each containing gr. j½ (0.09) of aloes, asafetida and soap (useful in flatulent dyspepsia with constipation); *extract* (*extractum aloes*), dose gr. j–v (0.06–0.3); *tincture* (*tinctura aloes*), dose fʒj–iv (4.0–16.0); *tincture of aloes and myrrh* (*tinctura aloes et myrrhæ*), dose fʒj–ij (4.0–8.0).

ALOINUM (*aloin*) is official, dose gr. $\frac{1}{10}$–j (0.006–0.06).

SENNA. LEPTANDRA. EUONYMUS.

What are these medicines?

SENNA is the *leaflets* of Cassia acutifolia (Alexandria Senna) and of C. angustifolia (Indian Senna) (*Nat Ord.* Leguminosæ). It contains *cathartic acid*, *chrysophanic acid*, *sennit* and *sennacrol*. It is a prompt and efficient purgative, and probably acts on the entire length of the intestine, causing some griping. It is a mild hepatic stimulant. It is used where a prompt and decided cathartic effect is desired, usually in combination to prevent griping. Its preparations are, the *fluid extract* (*extractum sennæ fluidum*) dose fʒj–iv (4.0–16.0); *confection* (*confectio sennæ*), an excellent purgative during pregnancy, ʒj–ij (4.0–8.0); *compound infusion* (*infusum sennæ compositum*), also called *black draught*, f℥ss–iv (15.0–120.0); *syrup* (*syrupus sennæ*) fʒj–ij (4.0–8.0); *compound powder of glycyrrhiza* (or of *liquorice*) (*pulvis glycyrrhizæ compositus*), an excellent purgative, dose a teaspoonful (4.0) at bedtime.

LEPTANDRA is the *rhizome* and *roots* of Veronica virginica, Culver's root or physic (*Nat. Ord.* Scrophularineæ). It contains *leptandrin*, and is a feeble stimulant to the liver and intestinal glands. Dose of the *extract* (*extractum leptandræ*) gr. j–iv (0.06–0.25); of the *fluid extract* (*extractum leptandræ fluidum*) fʒss–j (2.0–4.0).

EUONYMUS, or wahoo, the *bark* of the root of E. atropurpureus (*Nat. Ord.* Celastrineæ), contains a bitter principle, *euonymin*, *resins*, *euonic acid*, etc.; is a powerful hepatic stimulant, and increases the intestinal secretion. It is *used* as a purgative in torpidity of the liver and intestines. Dose of the *extract* (*extractum euonymi*) gr. ij–iv (0.13–0.26) in pill.

MERCURIAL CATHARTICS.

What mercurials are used as simple purgatives?

HYDRARGYRI CHLORIDUM MITE (*mercurous chloride* or *calomel*), dose gr. ss–j to x (0.03–0.6), at bedtime; and MASSA HYDRARGYRI (*mercurial* or *blue mass*), dose gr. v–xv (0.3–1.0). They will be found under the head of "*Alteratives*."

Saline Cathartics.

What are saline cathartics?

The saline cathartics are certain *salts* which produce an evacuation of the bowel not only by increasing peristalsis from their irritant effect, but also by promoting outward osmosis from the blood, thus rendering the stool liquid, depleting the bloodvessels, and consequently favoring absorption of effused fluids.

Name the medicines of this group.

The magnesium salts, some of the sodium and some of the potassium salts, and manganese sulphate.

Describe the effects, uses, preparations, and doses of the magnesium salts.

Magnesia (*calcined magnesia*) and Magnesia Ponderosa (*heavy magnesia*—is similar to *Henry's*, *Husband's*, and *Ellis'* magnesias) are antacid and cathartic, are mild in their action and are excellent preparations for children; dose as an antacid gr. xx (1.2), as a cathartic ʒj (4.0) or more.

Magnesii Carbonas (*magnesium carbonate—magnesia alba*), not much used; dose as an antacid gr. x–xx (0.6–1.2), as a cathartic ʒj–ij (4.0–8.0).

Magnesii Sulphas (*magnesium sulphate—Epsom salt*) is much more powerful than the preceding preparations, and produces free, watery purgation with very little irritation. It is used as a *purgative* to remove *fecal accumulations;* as a *depletant* in *entero-colitis* and *acute dysentery* (with opium); to *aid absorption* (given in very concentrated solutions) in *dropsical effusions*, especially hydrothorax; and for the relief of *colica pictonum* and other forms of lead-poisoning; dose ℥ss–j (15.0–31.0).

Magnesii Citras Effervescens (*effervescent magnesium citrate*), dose ʒj–iv (4.0–16.0) taken in water while effervescing.

Liquor Magnesii Citratis (*solution of magnesium citrate*). The citrates are similar in effect to the sulphate, but are more apt to irritate; dose half to a whole bottle full (180.0–360.0 c.c.).

What salts of sodium are used as cathartics?

Sodii Sulphas (*sodium sulphate—Glauber's salt*) is similar in its effects to Epsom salt, but more irritant and disagreeable. It is a mild hepatic stimulant. It is not much used; dose ʒj–iv (4.0–16.0).

Sodii Phosphas (*sodium phosphate*) is a mild cathartic and hepatic stimulant. It is an excellent purgative in *catarrhal conditions of the bowel*, in *catarrhal jaundice*, and in *chronic infantile diarrhœa* with pasty stools; dose ʒj–℥j (4.0–31.0).

Sodii Pyrophosphas (*sodium pyrophosphate*) resembles the preceding salt in action and uses; dose ʒss–iv (2.0–16.0).

What potassium salts are used as cathartics?

Potassii Sulphas (*potassium sulphate*) was formerly, but is not at present, much used; dose gr. xv–ʒj (1.0–4.0).

Potassii Bitartras (*potassium bitartrate—cream of tartar—cremor tartar*) is a diuretic, refrigerant and cathartic. In overdoses it causes gastro-enteritis. Dose as *diuretic* gr. x–ʒj (0.6–4.0), as a *mild laxative* ʒss–j (2.0–4.0), as a saline cathartic ℥ss (16.0).

Potassii et Sodii Tartras (*potassium and sodium tartrate—Rochelle salt*) resembles Epsom salt, but is not so powerful; dose ℥ss–j (16.0–31.0).

Pulvis Effervescens Compositus (*compound effervescing powder—seidlitz powder*) consists of Rochelle salt ʒij (7.75) with sodium bicarbonate gr. xl (2.59) in a blue, and tartaric acid gr. xxxv (2.25) in a white paper, their contents to be dissolved separately, the solutions mixed and taken while effervescing, on an empty stomach.

What is manganese sulphate?

Mangani Sulphas (*manganese sulphate*) has been discussed with the tonics. It is a hepatic stimulant and cathartic also, resembling Epsom salt, but is a dangerous remedy, and is not much employed; dose gr. j–v (0.06–0.3).

Drastic Cathartics.

What are drastic cathartics?

Cathartics which cause much irritation and act very powerfully are so called. Most of them in overdoses cause irritant poisoning. When they produce very free, watery evacuations they are sometimes spoken of as "*hydragogues.*" The more powerful drastics are used as revulsives in cerebral affections.

Describe the medicines employed as drastics.

JALAPA (*jalap*), the *tuberous root* of Ipomœa Jalapa (*Nat. Ord.* Convolvulaceæ), a Mexican plant, contains a *resin*, to which its purgative properties are due.

It is a prompt and powerful hydragogue and cholagogue in overdoses, causing gastro-intestinal irritation and even death. It is *used* as a hydragogue in *dropsies* of cardiac or renal origin, as in ascites or anasarca, and sometimes as a cerebral revulsant. Its preparations are *extract* (*extractum jalapæ*), dose gr. j–x (0.06–0.6); *compound powder* (*pulvis jalapæ compositus*), containing 35 per cent. of jalap with cream of tartar, dose gr. x–ʒj (0.6–4.0); and the *resin* (*resina jalapæ*), dose gr. j–v (0.06–0.3).

BRYONIA (*bryony*), the *root* of B. alba and B. dioica (*Nat. Ord.* Cucurbitaceæ), European climbing vines, contains a glucoside, *bryonin*, probably the active principle. It is a violent hydragogue cathartic resembling jalap in its *effects*, and also proving *diuretic.* It is *used* as a hydragogue in dropsies, especially in hydrothorax and hydropericardium. The *tincture* (*tinctura bryoniæ*) may be used in doses of fʒss–j (2.0–4.0).

PODOPHYLLUM, the *rhizome* and *roots* of P. peltatum, May-apple or mandrake (*Nat. Ord.* Berberideæ), a common indigenous plant, containing a resinous substance *podophyllotoxin*, consisting of picropodophyllin, the purgative principle, and podophyllinic acid, which is inert.

It is an active hydragogue and cholagogue, acting slowly and especially on the upper part of the small intestine and causing much irritation. In overdoses it is a gastro-intestinal irritant capable of causing death.

It is *used* as a purgative and cholagogue in acute and chronic *constipation*, *bilious attacks* and in *torpor of the liver.* The dose of the *extract* (*extractum podophylli*) is gr. v–xv (0.3–1.0); of the *fluid extract* (*extractum podophylli fluidum*) ♏x–xx (0.6–1.2); of the *resin* gr. $\frac{1}{10}$–$\frac{1}{2}$ (0.006–0.03); the latter preparation is the only one in common use.

Podophyllotoxin (not official) may be used in the form of a 1 per cent. alcoholic solution, the dose of which is gtt. x–xxx (1.0–3.0). *It is used hypodermically*, dose gr. $\frac{1}{4}$ (0.016).

IRIS, the *rhizome* and *roots* of I. versicolor, or blue-flag (*Nat. Ord.* Irideæ); contains a purgative *resin*. It is a powerful stimulant to the liver and intestinal glands, *acting* like podophyllum, but with less irritation. It is *diuretic*, and in overdoses irritant and depressant. It is *used* in *dropsies, jaundice of malarial origin*, and *torpor of the liver*. Dose of the *extract* (*extractum iridis*) gr. ij–iv (0.1–0.25); of the *fluid extract* (*extractum iridis fluidum*) ♏x–ʒj (0.6–4.0).

CHELIDONIUM, celandine or tetterwort, is the *herb* C. majus (*Nat. Ord.* Papaveraceæ); contains *chelerythrine* and *chelidonine* combined with *chelidoninic acid*. It is *used* as a *hydragogue cathartic*, and is supposed to possess *cholagogue effects* and some *narcotic* properties. It may be given in doses of gr. x–ʒj (0.6–4.0), in a fluid extract or infusion.

SCAMMONIUM (*scammony*) is a *resinous exudation* from the living *root* of Convolvulus Scammonia (*Nat. Ord.* Convolvulaceæ), a Syrian plant. The resin *scammonin* is the active portion. It is a *violent hydragogue*, resembling jalap in its action, but much more irritating. It is never given except in combination with other cathartics. The dose of the *resin* (*resina scammonii*) is gr. ij–viij (0.13–0.5). It is one of the ingredients of *compound extract of colocynth*.

COLOCYNTHIS (*colocynth*), the *fruit*, deprived of the rind, of Citrullus colocynthis, or bitter cucumber (*Nat. Ord.* Cucurbitaceæ), contains a glucoside (the purgative principle) called *colocynthin*, also a *resin*, *colocynthitin*, etc.

It is an *hepatic stimulant* and *violent hydragogue*, and in overdoses causes death from gastro-enteritis. It is never given alone, but is *used* in small doses to increase the effects of milder cathartics. The *extract* (*extractum colocynthidis*) is used in combination with other purgatives, dose gr. ij–v (0.13–0.3); *compound extract* (*extractum colocynthidis compositum*) containing also aloes, resin of scammony, cardamom and soap, dose gr. iij–x (0.2–0.64).

CAMBOGIA (*gamboge*) is a *gum-resin* obtained from Garcinia

Hanburii (*Nat. Ord.* Guttiferæ), a tree of Siam. The resin is the purgative principle and is called *cambogic acid.* It is a very powerful *hydragogue cathartic,* and in overdoses has caused death. It is rarely *used* alone. Dose gr. ij–v (0.13–0.3).

Pilulæ Catharticæ Compositæ (*compound cathartic pills*). Each pill contains of compound extract of colocynth gr. j⅓ (0.08), of calomel and of extract of jalap each gr. j (0.06) and of gamboge gr. ¼ (0.015).

Pilulæ Catharticæ Vegitabiles (*vegetable cathartic pills*). Each pill contains of compound extract of colocynth gr. j (0.06), of extract of hyoscyamus and of jalap each gr. ss (0.03), of extract of leptandrin and of resin of podophyllum each gr. ¼ (0.015) with oil of peppermint.

Elaterinum (*elaterin*) is a *neutral principle* extracted from Elaterium, a substance deposited by the juice of the fruit of Ecballium Elaterium, or squirting cucumber (*Nat. Ord.* Cucurbitaceæ). It is one of the most powerful of the *hydragogues,* also proving *diuretic,* and in excessive doses often causing death. It is much *used* in *dropsies,* in *uræmia* and as a cerebral *revulsive.* The dose is gr. $\frac{1}{20}$ (0.003); of the *trituration* (*trituratio elaterini*) gr. ¼–ss (0.016–0.03).

Oleum Tiglii (*croton oil*) is a *fixed oil* expressed from the *seeds* of Croton Tiglium (*Nat. Ord.* Euphorbiaceæ), a tree of India. The active principle has not been isolated.

When applied to the skin croton oil is an intense irritant, causing a papular eruption which soon becomes pustular. Given internally it is a powerful and rapid hydragogue cathartic, causing severe griping pains and to some extent depressing the circulation. In overdoses it produces great depression and often proves fatal. In *obstinate constipation* it is very serviceable, and as a *revulsive* in cerebral affections, as apoplexy, it is the best hydragogue. It has been used externally as a *counter-irritant* (*q. v.*). Dose gtt. j (0.016–0.12), which may be given in pill or emulsion, or mixed with a few drops of glycerin or olive oil and placed on the patient's tongue when he cannot or will not swallow.

ENEMATA.

What are enemata?

Enemata are liquids injected into the rectum. They may be *nutritive*, *cathartic*, or *forced enemata*.

Nutritive enemata are used to nourish the patient when the stomach cannot retain or digest food. They should be small in amount, not exceeding f℥iij–iv (90.0–120.0) at a time, nor should they be too frequently repeated, else they will cause irritability of the rectum. They should be combined with some digestant, as pepsin or pancreatin.

Cathartic enemata are used to unload the bowels when irritation or inflammation of the stomach is present; to aid the action of cathartics taken by the mouth; to remove fæcal accumulations or retained and irritating secretions from the large intestine; to relieve tympanites; to remove ascarides; or to act as revulsives. The fluid used may be cold or warm water, either simple or medicated, and the quantity will depend on the case. The injection should be made slowly and carefully, and the introduction of air is to be avoided.

Forced enemata are made slowly and gradually, the fluid, either warm water or warmed oil, being poured into a large funnel or rubber bag (fountain syringe) to which a long rubber tube is attached, armed with an injection pipe. By elevating the funnel or bag the fluid flows in a steady stream, the force being regulated by the height at which the bag is held. Forced enemata are employed principally to reduce intussusception of the bowels.

ORDER V.—ANTHELMINTICS.

What are anthelmintics?

Anthelmintics are medicines used to kill (*vermicides*) or cause the expulsion of (*vermifuges*) intestinal worms.

How are they administered?

They should be given fasting, and should be followed in 4 to 6 hours by a purgative, as calomel or castor oil.

Describe the medicines used as anthelmintics.

SPIGELIA, or pinkroot, the *rhizome* and *roots* of S. marilandica or Carolina pink (*Nat. Ord.* Loganiaceæ), contains a bitter principle, *volatile oil*, *resin*, *tannic acid*, etc. It slows the heart by stimulating the inhibiting centres, reduces arterial pressure by depressing the heart, and in overdoses quickens the pulse, increases the blood-pressure, dilates the pupil, causes delirium, and, in fatal cases, death from respiratory paralysis. It is very efficient in causing the expulsion of *lumbrici*, but should be followed by a purge. Dose of the *fluid extract* (*extractum spigeliæ fluidum*) f℥j–ij (4.0–8.0), or to a child gtt. x (0.5) on sugar.

CHENOPODIUM or American wormseed, the *fruit* of C. ambrosioides or Jerusalem oak (*Nat. Ord.* Chenopodiaceæ), contains a *volatile oil*, to which its effects are due. It is a very efficient remedy for the expulsion of *lumbrici*, and should be followed by a brisk cathartic. The *oil* (*oleum chenopodii*) is given in doses of gtt. v–x (0.25–0.5) on sugar, to a child 3 years old, before meals.

SANTONICA or Levant wormseed is the *unexpanded flower-heads* of Artemisia pauciflora (*Nat. Ord.* Compositæ). The active principle is *santonin*. *Large doses* cause salivation, rapid breathing, slow, labored pulse, trembling, yellow vision and yellow urine, unconsciousness, convulsions, dilated pupils and death. It is used almost exclusively as a remedy for *lumbrici*. Dose of *santonin* (*santoninum*) for an adult gr. ss–v (0.03–0.3); for a child 2 years old gr. ¼ (0.016). *Troches of santonin* (*trochisci santonini*) each contain gr. ss (0.03) of santonin, dose 1 to 6 troches.

ASPIDIUM, the *rhizome* of Dryopteris filix-mas, or male fern, and D. marginale (*Nat. Ord.* Filices), contains *filicic acid*, *volatile* and *fixed oils*, *resin*, etc., and is used as a *tæniacide*. Like all remedies employed for this purpose, its administration should be preceded by a fast of 24 hours and followed by a brisk cathartic. In overdoses it has caused death from enteritis. Dose of the *oleoresin* (*oleoresina aspidii*) fℨss–j (2.0–4.0).

GRANATUM (*pomegranate*), the *bark* of the *stem* and *root* of Punica Granatum (*Nat. Ord.* Lythrarieæ), contains four alkaloids, *pelletierine* and three allied alkaloids, which are powerful *tæniacides*, as is also granatum itself. In overdoses they are said to act on the muscles like woorara. Dose of pomegranate in decoction (℥ij (59.147) to water Oij (946.358) boiled to Oj (473.179)) f℥ij (59.147) repeated 3 times at an hour's interval, before breakfast; of *pelletierine tannate* gr. v–x (0.3–0.6).

Cusso (*Kousso; Brayera*, Pharm. 1880), the *female inflorescence* of Hagenia abyssinica (*Nat. Ord.* Rosaceæ), contains *protokosin* (a crystalline, inactive resin) and *kosotoxin* (an amorphous, highly active resin), and is used as a *tæniacide;* dose of the *fluid extract* (*extractum cusso fluidum*), fʒij–iv (8.0–15.0).

Kamala, the *glands* and *hairs* from the capsules of Mallotus philippinensis (*Nat. Ord.* Euphorbiaceæ), contains *rottlerin* and *isorottlerin*, resinoid substances, and is used as a *tæniacide;* dose ʒj–ij (4.0–8.0) of the powder in syrup, or given in the form of tincture.

Pepo (*pumpkin-seed*), the *seed* of the Cucurbita pepo or pumpkin (*Nat. Ord.* Cucurbitaceæ), contains a *resin*, and is one of the most powerful *tæniacides* in the materia medica and perfectly harmless; dose of the fresh seed (powdered with sugar) ℥j–ij (30.0–65.0).

Oleum Terebinthinæ (*oil of turpentine*) is an efficient but not a harmless remedy for *tænia* and *lumbrici*. It will be found under the head of "*Diuretics.*" Dose f℥ss–j (15.0–30.0) combined with castor oil.

Hydrargyri Chloridum Mite (*mercurous chloride or calomel*) is used alone or combined with other anthelmintics for the expulsion of *lumbrici* and (rarely) *tænia*. It should be given in full purgative doses (*v. Alteratives*).

What remedies are used for the destruction of ascarides?

Mild purgatives, as *calomel* or *sulphur*, may be used to dislodge them from the small intestines, but *injections of quassia-infusion*, *common salt*, *naphtol*, *tannin*, *alum* or *lime water* must be employed to get rid of those in the colon. *Injections of sweet oil* at bedtime are useful to kill any which may be in the rectum, and prevent the excessive itching which they cause. The child should be prevented from scratching the anus, as the ova are very tenacious, and adhering to the finger nails may be conveyed to the mouth and reproduce the trouble.

What are useful adjuncts to the anthelmintics?

Iron and the *bitter tonics*, by restoring tone to the mucous membranes, prevent the excessive secretion of mucus which forms a suitable nidus for the development of parasites.

Class III.—Medicines acting on the body by their effect on the various secretions and excretions.

ORDER I.—DIURETICS.

What are diuretics?

Diuretics are medicines used to increase the excretion of urine. acting either *directly* on the secreting cells of the kidney, or *indirectly* by their influence on the blood-pressure in the glomeruli.

For what purposes are they used?

They are used (1) to maintain the *function of the kidneys* in suppression of urine independent of the cause; (2) to promote the excretion of *urinary solids* (injurious waste products) or of poisons from the blood, as in uræmia, gout, rheumatism, fevers, and in cases of various metallic and vegetable poisons; (3) to promote the excretion of *water*, thus tending to dilute highly concentrated urine or to aid in the removal of effused (dropsical) fluids; and (4) to alter the *chemical reaction* of the urine and render that fluid more bland, thus lessening vesical and urethral irritation and any tendency which may exist to the formation of calculi.

A certain relation exists between the functions of the skin, kidneys and bowels, so that free catharsis or free diaphoresis will diminish the urinary secretion and *vicê versâ.*

How may diuretics be classified?

They may be divided into alkaline, hydragogue and alterative diuretics.

ALKALINE DIURETICS.

What are the alkaline diuretics?

They are those salts which, without materially increasing the amount of water, usually increase the elimination of its solid ingredients and modify or alter its chemical reaction.

Name the alkaline diuretics.

The potassium and lithium salts, and strontium lactate.

POTASSIUM.

What is the source of potassium?

Potassium is obtained from the ashes of plants, from native *nitre*, and from *tartar* or *argol*, deposited from wine during fermentation.

What are the general physiological actions of its salts?

Locally applied *caustic potash* destroys tissues by abstracting water, dissolving albumin and saponifying fats. *Internally* in *small doses* before meals, they increase the acidity of the gastric juice; in *large doses*, or after meals, they neutralize the acid present in the stomach. The *bicarbonates*, when taken on an empty stomach, enter the blood readily, and abstracting the base from basic and neutral potassium phosphate convert it into the acid phosphate, thus *increasing the acidity of the urine;* but if taken after or during meals, they are decomposed in the stomach, and entering the blood as a carbonate, *diminish the acidity of the urine.* The *salts formed with the vegetable acids* are converted into carbonates in the system and render the urine less acid. Potassium and its salts promote oxidation (and hence cause emaciation when used continuously), decreasing the amount of uric acid and increasing the urea excreted by the urine. The *nitrate* and *chlorate* are not decomposed in the system, and having effects peculiar to themselves, will be separately considered. All the potassium salts are protoplasmic poisons, in very large doses paralyzing the heart in diastole by direct action on its muscle and contained ganglia. They also depress and paralyze the functions of the brain and spinal cord. They all prove diuretic, increasing the amount of water passed and, by promoting oxidation, the elimination of urea. *Poisoning* by *caustic potash* is due to its corrosive properties, and if recovery takes place from the acute effects, various stenoses are apt to follow. The *carbonate* in overdoses causes violent gastro-enteritis with great cardiac depression and sometimes paralysis. The *treatment* of potassium poisoning consists in neutralizing the alkali by a vegetable acid, giving demulcents and fixed oils as protectives, and stimulating if requisite.

What are the therapeutical uses of the potassium salts?

The potassium salts are used as *diuretics* (increasing as they do both the water and salts of the urine, and converting uric acid into the more soluble urea as well as rendering the urine alkaline) in *acute rheumatism*, *uric acid diathesis*, in *desquamative nephritis*, and to alkalinize the urine in *cystic* and *urethral irritation.*

What are the potassium preparations, their uses and doses?

Liquor Potassæ (*solution of potassa*) contains 5 per cent. of potassium hydrate, and is *antacid* and *diuretic*. It is used to render the urine alkaline in cystic irritability and in gonorrhœa; dose ♏x–xx (0.6–1.2) freely diluted.

Potassii Carbonas (*potassium carbonate*) is *antacid* and *diuretic*, but is more irritating to the stomach than the bicarbonate; dose gr. x–xx (0.6–1.2).

Potassii Bicarbonas (*potassium bicarbonate*) is *antacid* and *diuretic;* dose gr. xx–ʒj (1.2–4.0). It is much used in the treatment of *acute rheumatism*, especially in plethoric persons (℥jss (45.0) are given in the first twenty-four hours, half as much during the second day, and afterward enough to keep the urine alkaline).

Potassii Citras (*potassium citrate*) is used as a *diuretic* in acute rheumatism and as a refrigerant diaphoretic in fevers and acute inflammations; dose gr. xx (1.2) in solution every hour or two.

Liquor Potassii Citratis (*solution of potassium citrate*) contains 8 per cent. of the bicarbonate and 6 per cent. of citric acid. It is often prescribed with sweet spirits of nitre, in fever mixtures; dose f℥ss (15.0).

Potassii Citras Effervescens (*effervescent potassium citrate*) is made by mixing thoroughly, drying and powdering citric acid (63.0), potassium bicarbonate (90.0), and sugar (47.0). Dose ʒss–j (2.0–4.0).

Neutral mixture (not official) is made by neutralizing fresh lemon-juice, with the bicarbonate. The official *solution of potassium citrate* has superseded it, as being the more exact and more elegant method of prescribing the same medicine; dose f℥ss–j (15.0–30.0).

Effervescing draught (not official) is made by adding f℥j (29.57) of a solution of the bicarbonate (ʒj (3.88)–f℥iij (88.7)) to f℥j (29.57) of lemon-juice and water (equal parts). It is particularly acceptable to febrile patients with irritable stomachs.

Potassii Acetas (*potassium acetate*) is *antacid*, *diuretic*, and in large doses a *mild cathartic*. It is chiefly used as a *diuretic* in acute rheumatism and to some extent in dropsies, and in uric acid diathesis; *dose gr. xx–ʒj (1.2–4.0).*

Potassii Bitartras (*potassium bitartrate—cream of tartar*) is a *diuretic* and *saline cathartic* (*q. v.*) much employed in dropsies.

Potassii Nitras (*potassium nitrate—saltpetre—nitre*) *locally* applied is a powerful irritant to the mucous membranes and to raw surfaces. It passes through the system unchanged, and is eliminated chiefly by the urine, increasing the amount passed but not affecting its reaction to the same extent as the other salts. *Poisoning* occurs more frequently from the nitrate than from any other potassium salt, the symptoms being burning pain in the throat and epigastrium, hæmatemesis and bloody stools, muscular weakness, syncope, collapse sometimes preceded by convulsions or paralysis, suppression of urine and death. The *treatment* consists in evacuating the contents of the stomach and administering opiates, demulcents and stimulants.

It is *used* in *acute rheumatism* as a *diuretic*, but is probably inferior to the salts formed with the vegetable acids. It is used in *fevers* for the same purpose and has been given in small doses combined with Dover's powder as a *diaphoretic* in *acute muscular rheumatism*. Dose of potassium nitrate gr. x–xxx (0.6–1.9). *Papers of potassium nitrate* (*charta potassii nitratis*), consisting of strips of unsized paper immersed in a 20 per cent. solution of the salt, are burned and the fumes inhaled with success in spasmodic asthma. It is probable that the *nitrite* is formed by the combustion and is the active agent in these cases.

Potassii Chloras (*potassium chlorate*) is a *local* irritant. *Internally* in large doses it causes gastro-enteritis, affects the circulation as do the other potassium salts, damages the blood corpuscles and interferes with oxygenation by the formation of methæmoglobin, and produces a condition of acute tubal nephritis. Cases of poisoning are not infrequent, and death is usually preceded by profuse salivation, great dyspnœa, cyanosis, delirium, coma, tonic and clonic spasms, and sometimes ecchymoses and jaundice. It increases the excretion of urine, but does not affect its chemical reaction.

It has been *used* as a diuretic in dropsies, but is dangerous and inferior to other preparations. As an *alterative* in the exanthemata it is now little employed. In *mercurial*, *follicular* or *aphthous stomatitis* it is of unquestionable value, given internally with sugar or used as a gargle. In ordinary sore throat and in tonsillitis it is useful as a local application; dose gr. v–xxx (0.3–2.0). It must be given freely diluted. It should not be prescribed in powder with readily oxidizable or combustible substances, as when triturated with them it forms explosive compounds. As a gargle ʒss–iv (2.0–15.0) in water Oj (473.1) may be used.

The *troches* (*trochisci potassii chloratis*) each contain gr. v (0.3) of the salt.

The other potassium preparations have been or will be considered in their appropriate place.

LITHIUM.

What are the sources of lithium?

Lithium is a chemical element, found native in the form of silicates, phosphates, etc.

What are the physiological effects and uses of the lithium salts?

The lithium salts appear to resemble those of potassium. They are eliminated by the urine as urates, increasing the urine and rendering it much more strongly alkaline than a corresponding amount of a potassium salt. As the urate of lithium is much more soluble than either the urate of sodium or of potassium, the lithium preparations are advantageously *used* in the treatment of *chronic gout* and *lithæmia*, and as a *local application* to gouty deposits either before or after the skin has broken. It has also been employed internally in *glycosuria*.

What are the preparations of lithium and their doses?

Lithii Carbonas (*lithium carbonate*), dose gr. v–x (0.3–0.6) freely diluted. As a local sorbefacient for gouty deposits a solution (gr. v (0.3)–f℥j (30.0)) should be kept constantly applied.

Lithii Citras (*lithium citrate*), dose gr. v–xx (0.3–1.2).

Lithii Citras Effervescens (*effervescent lithium citrate*) is made by triturating and thoroughly drying citric acid (370.0) with sugar (about 200.0); then triturating the mixture with lithium carbonate (70.0), sodium bicarbonate (280.0) and sugar (enough to make the product weigh 1000.0). Dose ʒj–ij (4.0–8.0).

Lithii Benzoas (*lithium benzoate*), dose gr. v–xx (0.3–1.2).

Lithium bromide and *L. salicylate* have been *previously mentioned.*

What sodium salt has been used as a diuretic?

SODII ACETAS (*sodium acetate*) is supposed to possess properties similar to those of potassium acetate, and has been used for the same purposes and in the same doses.

What preparation of strontium is used as a diuretic?

STRONTII LACTAS (*strontium lactate*) has been used as a diuretic, especially in *acute desquamative nephritis*, with scanty urine, where it has been found to increase the amount of urine and diminish the albumin present in that excretion. It has also been used in *other forms of kidney disease*, but is much less efficient in chronic than in acute cases. It has been used as an *intestinal antiseptic*, but is of little value for this purpose. Dose gr. v–xv (0.3–1.0) in solution.

HYDRAGOGUE DIURETICS.

What are hydragogue diuretics?

The medicines of this group greatly increase the flow of the *watery* element of the urine, and are hence used in the treatment of dropsies.

Name the hydragogue diuretics?

Squill, digitalis, caffeine, sodio-theobromine salicylate, apocynum, broom, dandelion, sweet spirit of nitre, and mercurials.

SCILLA—SQUILL.

What is squill?

Squill is the *bulb* of Urginea maritima (*Nat. Ord.* Liliaceæ) deprived of its dry, membranous outer scales, and cut into thin slices, the central portions being rejected. It contains *scillipicrin*, *scillitoxin*, and *scillin*. In *small doses* squill increases the mucous secretions and is a stimulating expectorant, while it markedly increases the urinary secretion. In *large doses* it causes nausea, vomiting, and sometimes purging, and in *excessive doses* produces in addition great abdominal pain, with scanty, bloody, or even suppressed urine, great depression, collapse, convulsions and death.

Scillipicrin appears to be the diuretic principle. *Scillitoxin* slows the pulse, and in overdoses causes diastolic cardiac arrest by stimulating the peripheral vagi; after large doses the vagi are finally paralyzed and the pulse becomes rapid. *Scillin* is devoid of diuretic effects, but appears to be the emetic principle.

The *treatment of poisoning* consists of evacuating the contents of the stomach and the use of opiates and demulcents. If collapse occurs alcohol must be employed.

Squill is *used* as a *diuretic* in *dropsy*, but should not be employed if kidney disease or cystitis is present. It is frequently combined with digitalis in cardiac dropsies, and in chronic pleurisy or pericarditis is often given with calomel. As an *expectorant* it is much used in *bronchial* affections. As an *emetic* it is too dangerous a remedy to employ.

As a *diuretic* or *expectorant* squill may be given in doses of gr. j–ij (0.06–0.13) repeated every 2 hours and gradually increased until nausea occurs. Doses of gr. vj–xij (0.389–0.778) generally prove emetic. The dose of the *fluid extract* (*extractum scillæ fluidum*) is ♏j–ij (0.06–0.12); of the *tincture* (*tinctura scillæ*) ♏x–xxx (0.6–1.8); of the *vinegar* (*acetum scillæ*) ♏x–xxx (0.6–1.8); of the *syrup* (*syrupus scillæ*) fʒss–j (2.0–4.0); of the *compound syrup* (*syrupus scillæ compositus—Coxe's hive syrup*), containing squill and senega and gr. j (0.059) of tartar emetic in each ounce (29.5), ♏v–fʒj (0.3–4.0).

DIGITALIS—CAFFEINE.

Are these drugs used as diuretics?

The uses of these remedies as diuretics have already been discussed under the head of "*Cardiac Stimulants.*" For this purpose the best preparations of digitalis are the *infusion*, the *powdered leaves* or the *tincture.*

SODIO-THEOBROMINE SALICYLATE.

What is sodio-theobromine salicylate?

Sodio-theobromine salicylate, or *diuretin* (*the proprietary name*), is a non-official preparation "obtained by mixing aqueous solutions of equal molecules of sodium theobromine and salicylic acid, and evaporating to dryness; a definite compound appears to be formed containing theoretically 49.7 per cent. of theobromine and 38.1 per cent. of salicylic acid. It occurs as a white powder, odorless, of a saline, alkaline taste, and soluble in one-half its weight of warm water, the solution remaining perfect on cooling."*

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* National Dispensatory.

Its physiological action is not fully understood. It is a powerful *diuretic* in certain diseased conditions, as when *anasarca* is present, due to disease of the heart or kidneys, but appears to have no diuretic effect when given to healthy persons.

It has little if any effect upon the *circulation* except in the diseased conditions above mentioned, when it appears to increase the force and render more regular the beat of the heart, probably by increasing diuresis and removing the fluid which has been acting as a mechanical obstruction to the circulation.

The action on the *kidneys* is not understood, but is non-irritating in character. Under its use the amount of *solid* as well as the *fluid* of the urine is much increased, the latter sometimes enormously, as much as three gallons of urine having been reported as passed in 24 hours while using the drug. As the dropsical accumulation diminishes, the amount of urine lessens.

Sometimes sodio-theobromine salicylate causes "nervousness," headache or vertigo, tinnitus aurium, and palpitation. Occasionally a rise in temperature is seen after its use. In rare cases a cutaneous eruption attended with more or less intense itching appears. More frequently, however, it acts as a gastro-intestinal irritant, causing loss of appetite, nausea, and sometimes severe vomiting and purging.

The *therapeutical uses* of this drug are indicated by what has been already said. It is of great value in all *dropsical effusions* depending on disease of the kidney or heart, and should always be tried in these conditions when remedies like digitalis, strophanthus, etc., have not succeeded in reducing the dropsy. In pleuritic effusions it is not so certain in its action. In ascites due to portal obstruction it usually appears to produce no effect. In dropsies dependent on tubercular inflammation it is absolutely valueless. Dose gr. xv (1.0) repeated every 2 or 3 hours until some effect is produced. The author has never found it necessary to give more than ʒjss (6.0) in 24 hours, although some observers have prescribed double that quantity in the same period of time without ill effect. It is administered in solution in plain water flavored with peppermint or other aromatic. It may be given in capsules.

APOCYNUM.

What is apocynum?

Apocynum, Canadian hemp, or milk-weed, is the *root* of A. cannabinum (*Nat. Ord.* Apocynaceæ) and contains *apocynin* and *apocyneïn*, a glucoside. These substances are supposed to be cardiac tonics, acting on the heart similarly to digitalis. They are also diuretic. Apocynum is laxative in *small*, but emetic and cathartic in large doses. It is chiefly *used* as a diuretic in dropsies, and should not be given in quantities sufficient to purge when the former effect is desired; *extractum apocyni fluidum* (*fluid extract of apocynum*), dose ♏v–xxx (0.3–2.0).

SCOPARIUS.

What is scoparius?

Scoparius is the *tops* of Cytisus Scoparius or broom (*Nat. Ord.* Leguminosæ), and contains a volatile liquid alkaloid, *sparteine* (*v.* "*Cardiac Stimulants*"), and a neutral principle, *scoparin*, in which the diuretic properties are supposed to reside. Broom is an efficient hydragogue diuretic, and in large doses produces free purging and sometimes vomiting. It is much *used* in the treatment of *dropsies* and is best given in decoction (℥ss (14.7) to water Oj (473.1) boiled down to Oss (236.5), dose f℥j (30.0) every 2 or 3 hours until an effect is produced) or the *fluid extract* (*extractum scoparii fluidum*) may be given in doses of fʒss–j (2.0–4.0).

TARAXACUM.

What is taraxacum?

It is the *root* of Taraxacum officinale or dandelion ((*Nat. Ord.* Compositæ) gathered in the autumn, and contains a bitter principle, *taraxacin;* also *taraxacerin*, *inulin*, resin, etc.

It is *diuretic*, laxative, and slightly cholagogue, and is *used* in dropsies of hepatic origin and dyspepsia with torpor of the liver. Dose of the *extract* (*extractum taraxaci*) gr. xx–ʒj (1.28–4.0), of the *fluid extract* (*extractum taraxaci fluidum*) fʒj–ij (4.0–8.0).

SPIRITUS ÆTHERIS NITROSI—SPIRIT OF NITROUS ETHER.

Is this medicine a diuretic?

Sweet spirit of nitre is diuretic in large doses if the surface of the *body is kept cool. It* is usually combined with other diuretics, but may be given alone where the urinary secretion is scanty from simple congestion or from purely functional causes. It will be considered more fully under "*Diaphoretics.*" Dose f℥j–iv (4.0–15.0) freely diluted.

MERCURIALS.

Are the mercurial preparations ever used as diuretics?

Calomel (*q. v.*) has been employed as a diuretic in cardiac dropsy, dose gr. iss 4 or 5 times a day. It is a useful adjunct to squill in hydrothorax and hydropericardium.

Corrosive sublimate will probably prove to be a more powerful diuretic, as by its action on the liver it increases the formation of urea, which of itself always increases the excretion of water by the urine.

ALTERATIVE DIURETICS.

What are alterative diuretics?

They are medicines which are employed not only as diuretics but also for their effect on the mucous membrane of the urinary tract, by which they are possibly to some extent excreted, or on which they exercise an alterant and sedative effect during their passage in the urine.

Name the medicines belonging to this group.

Buchu, pareira, uva ursi, chimaphila, triticum, juniper, oil of erigeron, oil of santal, stigmata maydis, turpentine, copaiba, cubeb, matico, cantharides.

BUCHU. PAREIRA.

What are these medicines?

BUCHU, the *leaves* of Barosma betulina and other species (*Nat. Ord.* Rutaceæ), natives of S. Africa, contains a *volatile oil* and a *bitter principle.* It is a mild tonic and diuretic, and slightly stimulates the genito-urinary mucous membranes, having also an alterative effect upon them.

It is *used* in chronic catarrhal conditions of the genito-urinary mucous tract, as *chronic pyelitis*, *chronic cystitis* and especially in irritation of the neck of the bladder; dose of the *fluid extract* (*extractum buchu fluidum*) f℥ss–j (2.0–4.0).

PAREIRA, the *root* of Chondodendron tormentosum (*Nat. Ord.* Menispermaceæ), a Brazilian plant, contains a bitter alkaloid, *cissampeline*, and has been used with success in the treatment of *chronic cystitis*, *gleet* and "*irritable bladder.*" It is said to be also tonic and laxative. Dose of the *fluid extract* (*extractum pareiræ fluidum*) fʒss–j (2.0–4.0).

UVA URSI. CHIMAPHILA.

What are these medicines?

UVA URSI is the *leaves* of Arctostaphylos Uva ursi or bearberry (*Nat. Ord.* Ericaceæ), and contains *tannic* and *gallic acid*, a glucoside called *arbutin*, *ericolin* (a bitter substance), etc. It is used as a mild astringent tonic, and diuretic in *chronic pyelitis* and *cystitis*, and has also been employed in *chronic bronchitis.*

Arbutin is the diuretic principle, and as it is, partially at least, eliminated as hydroquinone (*vid.* "*Antipyretics*"), it is supposed to act as an antiseptic to the urogenital tract. It has been employed in the above diseases and internally in *gonorrhœa.*

Dose of the *fluid extract* (*extractum uvæ ursi fluidum*) fʒss–ij (2.0–8.0), t. i. d.; of the *extract* (*extractum uvæ ursi*) gr. v–x (0.3–0.9).

CHIMAPHILA, the *leaves* of C. umbellata, pipsissewa, wintergreen, or ground holly (*Nat. Ord.* Ericaceæ), contains *arbutin*, *tannic acid*, *chimaphilin*, etc. It is tonic, astringent, and diuretic, resembling buchu and uva-ursi in its effects and uses. Special alterative qualities have been claimed for it in scrofulous affections.

Dose of the *fluid extract* (*extractum chimaphilæ fluidum*) fʒss–j (2.0–4.0), t. i. d.

TRITICUM.

What is triticum?

Triticum, the *rhizome* of Agropyrum repens or couch grass (*Nat. Ord.* Gramineæ), contains *triticin* and several *sugars*, and is feebly diuretic. It is useful in cystitis and in irritation of the neck of the bladder.

Dose of the *fluid extract* (*extractum tritici fluidum*) fʒss–ij (2.0–8.0).

JUNIPERUS—JUNIPER.

What is juniper?

Juniperus (*juniper*) (not official) is the *fruit* (or berries) of J. communis (*Nat. Ord.* Coniferæ), and contains a *volatile oil* (*oleum juniperi*, dose gtt. v–xv (0.3–0.9)), on which its diuretic effects depend. It is a stimulant to the kidneys, capable in overdoses of causing strangury and bloody urine, and is sometimes used as an emmenagogue. It is chiefly employed as an adjuvant to other diuretics, particularly the alkaline group. As an *alterative diuretic* it is used in *chronic pyelitis* and *chronic cystitis.* It is sometimes given in *subacute renal congestion*, but is contraindicated where active inflammation is present. It is occasionally used as a *carminative* and *stomachic.* The preparations (official) are the *spirit* (*spiritus juniperi*), containing 5 per cent. of the oil, dose ʒj–ij (4.0–8.0); the *compound spirit* (*spiritus juniperi compositus*) contains also the oils of caraway and fennel in alcohol and water, and is about the same strength as *gin*, which is often used as a substitute for it, dose fʒj–jv (4.0–15.0).

OLEUM ERIGERONTIS—OIL OF ERIGERON.

What is the oil of erigeron?

It is the *oil distilled* from the fresh flowering *herb* of Erigeron canadense, or Canada fleabane (*Nat. Ord.* Compositæ), and yields on distillation a *resin* and a *terpene.* It is *diuretic* and *hemostatic*, and is useful in hemorrhages due to relaxation of the genito-urinary mucous membrane. It has been used with success in *gonorrhœa.* Dose ♏v–xxx (0.3–2.0) on sugar or in capsule, every two or three hours.

OLEUM SANTALI—OIL OF SANTAL.

What is the oil of santal?

It is a *volatile oil* distilled from the *wood* of Santalum album (*Nat. Ord.* Santalaceæ). It is an *alterative*, *diuretic*, and *blennorrhetic*, sometimes causing vertigo, when its use should be discontinued or the dose decreased. Occasionally it produces gastro-intestinal irritation. It is used in the second stage of *gonorrhœa*, and in *chronic bronchitis* it is often beneficial; dose ♏v–xx (0.3–1.2) in emulsion or capsule, t. i. d.

ZEA.

What is this substance?

Zea, or corn silk, the *styles* and *stigmas* of Zea Mays or Indian corn (*Nat. Ord.* Gramineæ), is a mild, stimulating diuretic, and is strongly recommended in *cystitis*, both acute and chronic, in *gonorrhœa*, in *irritability of the bladder* depending upon a highly concentrated urine, in *nocturnal incontinence* in children, and even in *cardiac dropsy*. It is given in infusion ad libitum, or in the form of *fluid extract* (*extractum zeæ fluidum*), of which the dose is fʒj–ij (4.0–8.0) every hour or two.

TEREBINTHINA—TURPENTINE.

What are the officinal varieties of turpentine?

1. TEREBINTHINA (*turpentine* or *white turpentine*) is a *concrete oleoresin* obtained from Pinus palustris, yellow or pitch pine, and other varieties of Pinus (*Nat. Ord.* Coniferæ) trees indigenous to the Southern States.
2. TEREBINTHINA CANADENSIS (*Canada turpentine*, *Canada balsam* or *balsam of fir*) is a *liquid oleoresin* obtained from Abies balsamea, the American silver fir, or balm of gilead tree (*Nat. Ord.* Coniferæ), found in the northern portions of N. America.
3. Unofficinal varieties known to commerce are *Chian turpentine* derived from Pistacea Terebinthinus (*Nat. Ord.* Anacardaceæ), formerly used as a specific for internal (especially uterine) cancer, but possessing no curative power; *Bordeaux turpentine*, *Venice turpentine*, etc.

What do the turpentines contain?

They contain a *resin* or rosin (*resina*) united to a *volatile oil* (*oleum terebinthinæ*).

What are the effects and uses of turpentine?

The *effects* of turpentine are those of the oil which it contains. They are rarely *used* internally, but have been given as an alterative to the broncho-pulmonary and genito-urinary mucous membranes in chronic catarrhal conditions, and have been used as an anthelmintic, but for all these purposes the oil is preferred.

Dose as a *diuretic* and *blennorrhetic* gr. xx–ʒj (1.3–4.0), in pill or *emulsion; as an anthelmintic* ℥ss–j (15.5–31.0).

RESINA (*resin*) is only used externally as a basis for plasters and ointments. Its preparations are a *cerate* (*ceratum resinæ*), sometimes called basilicon ointment, and a *plaster* (*emplastrum resinæ*), adhesive or sticking plaster.

OLEUM TEREBINTHINÆ—OIL OF TURPENTINE.

What is the oil of turpentine?

Oil of turpentine or spirit of turpentine is a *volatile oil distilled* from turpentine.

What are its effects and uses?

Locally it is rubefacient. *Internally* it is carminative, in large doses causing mental exhilaration and increasing the force and frequency of the pulse and proving cathartic. It is eliminated by the lungs and kidneys, imparting a violet-like odor to the urine. In *excessive doses* it is capable of causing death (rare). The symptoms of poisoning are unconsciousness, bloody, often suppressed urine, and rapid, feeble pulse. Vomiting and strangury or purging sometimes occur and occasionally the pupils are dilated. Small doses seem to increase the pulse rate by direct action on the *heart*, while large doses stimulate the vagi and slow the heart. Moderate doses are diuretic, but when large amounts are given renal irritation results. It is *used* as an *alterative diuretic* in *chronic cystitis*, *gleet* and *chronic pyelitis*. In *impotence* and *spermatorrhœa* depending on relaxation it is sometimes employed. In *typhoid pneumonia* and *bronchitis*, and in *hypostatic pulmonary congestion*, as in typhoid fever, it is often used externally and internally with the happiest effect. It is very useful in *ulceration of the stomach* or *intestines*, and in *typhoid fever* when the tongue becomes brown and dry or cracked, red and glazed, or when the ulcers are very slow to heal; it acts not only locally but also as a cardiac stimulant. In *hemorrhages* from the lungs, stomach or bowels, in *post-partum hemorrhages* and in *purpura hemorrhagica* it is sometimes useful. As an addition to stimulating enemata to cause the expulsion of flatus or to rouse the system to shock it is much resorted to. It is also used as an *anthelmintic.*

Locally as a counterirritant, either as a liniment or fomentation, it is much used in *bronchitis* and in *muscular rheumatism*, and in the latter manner in *peritonitis*, *hysterical abdominal pains* and in *flatulency*. Dose ♏v–xv (0.3–0.9) 4 or 5 times daily in emulsion or capsule; as a cathartic enema or anthelmintic f℥ss–j (15.0–30.0) may be given. Externally a *liniment* (*linimentum terebinthinæ*) is employed, or the oil may be used either full strength or diluted with sweet oil. A saturated solution of camphor in oil of turpentine is a good rubefacient liniment.

Oleum Terebinthinæ Rectificatum (*rectified oil of turpentine*), dose ♏v–xxx (0.3–1.8).

COPAIBA.

What is copaiba?

Copaiba is the *oleoresin* of Copaiba Langsdorffii and other species (*Nat. Ord.* Leguminosæ), trees of S. America. It is cathartic, and sometimes emetic, in large doses, slightly stimulates the circulation and acts as an alterative blennorrhetic on the mucous membranes by which it is excreted. After large doses a resinous precipitate will occur if nitric acid be added to the urine, which, however, is soluble in alcohol. When the *resin* is taken in considerable quantities the urine responds to the copper tests for sugar. Copaiba is chiefly eliminated by the genito-urinary mucous membranes and to a slight extent by the lungs. Its use is sometimes followed by urticaria. It is *used* in *chronic genito-urinary inflammations*, especially in *gonorrhœa* after the subsidence of the acute stage. In *bronchorrhœa* it is sometimes employed. The *oil* has been lauded as a hydragogue diuretic in dropsies when not of renal origin. The *dose* of *copaiba* is ♏x–ʒj (0.6–3.6) or more in emulsion, pill, or capsule. The *mass* (*massa copaibæ—solidified copaiba*) contains 94 per cent. with magnesia, dose gr. v–xxx (0.3–2.0); of the *oil* (*oleum copaibæ*) the dose is ♏v–xv (0.3–0.9) in emulsion or capsule.

CUBEBA—CUBEB.

What is cubeb?

Cubeb is the *unripe fruit* of Piper Cubeba (*Nat. Ord.* Piperaceæ), an East Indian plant. It contains a *volatile oil*, a neutral principle (*cubebin*) and *cubebic acid*. Cubeb is diuretic and carminative, htly accelerating the pulse. In large doses it often causes vomit- and purging. It is eliminated by the mucous membranes and urine, increasing the excretion of uric acid. Its use is sometimes followed by urticaria. The addition of nitric acid to the urine after the use of cubeb produces a resinous precipitate.

It is *used* in *gonorrhœa* and is less apt than copaiba to disorder the digestion. It is also used in *bronchitis*, and has been smoked in cigarettes to relieve *sore throat* and *hoarseness*. The powder, used as a snuff, is employed in *coryza*. The *dose* of powdered cubeb is ʒss–iij (2.0–11.6); of the *oil* (*oleum cubebœ*) ♏x–xv (0.6–0.9) gradually increased. It is not as efficacious as the *oleoresin* (*oleoresina cubebœ*), dose ♏v–xxx (0.3–2.0) given in emulsion. Of the *tincture* (*tinctura cubebœ*) the dose is fʒj–ij (4.0–8.0); of the *fluid extract* (*extractum cubebœ fluidum*) fʒss–j (2.0–4.0). The troches (*trochisci cubebœ*) each contain gr. ss (0.04) of the oleoresin.

MATICO.

What is matico?

Matico is the *leaves* of Piper angustifolium (*Nat. Ord.* Piperaceæ), a shrub of Peru. It contains a *volatile oil*, *resin*, *artanthic* and *tannic acids*, etc. It is *used* as an *alterative blennorrhetic* in *gonorrhœa*, as a *hemostatic* in *internal hemorrhages*, and locally as a *styptic*. Dose of the *fluid extract* (*extractum matico*) fʒss–j (2.0–4.0); of the *tincture* (*tinctura matico*) fʒj–ij (4.0–8.0).

CANTHARIS—CANTHARIDES.

Is cantharides used as an alterative diuretic?

Cantharides is an intense stimulant and irritant to the kidneys, being diuretic in small doses, and frequently causing strangury, priapism and bloody urine. It is sometimes used in *gleet*, and in spermatorrhœa and impotence from weakness. It will be noticed at length under "*Epispastics.*" Dose of the *tincture* (*tinctura cantharidis*) gtt. v–x (0.3–0.6) t. i. d.

ORDER II.—DIAPHORETICS.

What are diaphoretics?

Diaphoretics are medicines which increase the secretion of sweat, by (1), stimulating the secretory nerve fibres in the glands; ating the nerve centre governing the secretion of sweat;

or (3) relaxing the skin, dilating the blood vessels and regulating the force of the circulation.

For what purposes are they used and how are they classified?

They are used (1) to abort an oncoming disease (as a catarrh or inflammation of mucous or serous membranes after exposure to cold) or aid in its subsidence (as in the paroxysm of a malarial fever); (2) to aid absorption, as in dropsies, and (3) to eliminate poisons from the blood.

They are divided into Nauseating, Sedative, Saline and Special Diaphoretics.

NAUSEATING DIAPHORETICS.

What are the nauseating diaphoretics?

The act of emesis is accompanied by general relaxation and diaphoresis, and even in nausea a more or less pronounced perspiration occurs. Any of the emetics in doses just sufficient to nauseate will produce this effect, but the only one which is in general use for this purpose is IPECAC (v. "*Emetics*"), which is used either alone (in doses of gr. ss–j every two hours) or combined with opium in the form of DOVER'S POWDER (*v.* "*Opium*") in the early stages of *inflammations*, in "*cold*," in *muscular rheumatism* and in acute *suppression of the menses* to break up the train of morbid symptoms.

SEDATIVE DIAPHORETICS.

What are sedative diaphoretics?

When the circulation is much excited, as in fevers and inflammations generally, medicines which tend to reduce the force and rapidity of the circulation and to lower the temperature, act as diaphoretics. Many of these agents (particularly *antimonials*, *aconite* and *veratrum viride*) tend to nauseate or even to cause vomiting when given in full doses. In *sthenic inflammations* the ANTIMONIAL PREPARATIONS (*q. v.*) especially if combined with minute doses of morphine are often very efficacious, and may be used in the *early stages* of *laryngitis* and *bronchitis* and in combination with other remedies in fever. ACONITE and VERATRUM VIRIDE are also sometimes *resorted to in* the early stages of sthenic inflammations for the bined sedative and sudorific effect. In this group also should be placed SALICYLIC ACID and other ANTIPYRETICS (*q. v.*) which produce more or less profuse perspiration.

SALINE DIAPHORETICS.

What are the saline diaphoretics?

While some of the saline diaphoretics have a sedative effect upon the circulation, which is not, however, as marked as the remedies of the preceding group, they have no tendency to nauseate even when given in large doses, on the contrary, they are acceptable to the stomach, and form the basis of most fever mixtures.

POTASSIUM CITRATE and its preparations have been noticed among the "*Diuretics.*"

LIQUOR AMMONII ACETATIS—SOLUTION OF AMMONIUM ACETATE.

What is the solution of ammonium acetate?

The *solution of ammonium acetate* or *spirit of mindererus* is a mild stimulant, diaphoretic and diuretic, often employed in febrile and inflammatory affections combined with other remedies. Dose f℥ss–j (15.0–30.0)

SPIRITUS ÆTHERIS NITROSI—SPIRIT OF NITROUS ETHER.

What is this substance?

Spirit of nitrous ether, or *sweet spirit of nitre*, is a solution of about 4 per cent. of nitrous ether (ethyl nitrite) in alcohol. In *small doses* it is a diaphoretic and stimulant, in *larger doses* an antispasmodic, and (if the skin be kept cool) diuretic; in *excessive doses*, either internally or when inhaled, it is a depresso-motor, acting similarly to the other nitrites (*q. v.*) and capable of causing death. It is much *used* as a diaphoretic in *fevers*, and occasionally as a diuretic (*q. v.*) and antispasmodic in nervous children. *Dose* for an *adult* fʒj–iv (4.0–15.0). It is given as a diaphoretic in minute doses, frequently repeated and largely diluted, the body being kept warm.

SPECIAL DIAPHORETICS.

PILOCARPUS.

What is pilocarpus?

Pilocarpus or *Jaborandi* is the *leaflets* of P. Selloanus (Rio de Jañeiro Jaborandi) and of P. Jaborandi (Pernambuco Jaborandi) (*Nat. Ord.* Rutaceæ), a Brazilian shrub.

What are its chief chemical constituents?

It contains an alkaloid, *pilocarpine*, and a *volatile oil;* a second alkaloid, *jaborine*, probably a derivative of pilocarpine, has been isolated, and lately two other derivative alkaloids *pilocarpidine* and *jaborandine* have been described.

What are the physiological effects of these substances?

In *medicinal doses pilocarpus* or *pilocarpine* produces profuse diaphoresis and salivation, sometimes copious, with flushed face and quickened circulation and respiration. Sometimes the mucous secretions are increased also, and nausea, even vomiting, may occur. It increases both the watery portion and the solids (especially urea) of the *perspiration* by a direct influence on the nerve endings governing its secretion, and probably increases the secretion of the *gastric juices* and *bronchial mucus* in the same manner. It appears to act directly as a stimulant upon the cells of the salivary glands. There seems to be some relation between its influence over the secretions of perspiration and saliva, the one being more profuse when the other is scanty, and *vice versâ*. In small doses frequently repeated it proves diuretic. It seems to stimulate the nutrition of the hair. The cardiac action is at first quickened, but soon slowed, and the arterial tension is elevated. Applied to the eye it contracts the pupil (by peripheral action) and increases the tension of accommodation. *Pilocarpine* and *atropine* are antagonists as regards their action on the heart, intestines and pupil, and on the secretions of perspiration and saliva. *Jaborine* acts upon the heart, pupil, intestines and salivary glands like atropine. *Pilocarpidine* causes profuse diaphoresis, salivation, vomiting and purging; while *jaborandine* resembles atropine in its cardiac effects.

What are the medicinal uses of pilocarpus and its alkaloid?

Pilocarpus or pilocarpine is used as a *diaphoretic* to abort disease in incipient catarrh and at the onset of a paroxysm of malarial fever; in various forms of *dropsy*, to aid in removal of the fluid, especially *hydrothorax*, and in *pulmonary œdema;* in *uræmia*, to eliminate the poison from the blood, it is of great value, and similarly in *acute* or *chronic Bright's disease*, to relieve the kidneys of some of their work, it is very useful. It is also employed in *subacute* and *muscular rheumatism.*

As a *diuretic*, minute doses (pilocarpine gr. $\frac{1}{12}$ (0.005), are given in acute *suppression of urine*, but when thus used in the early stages of acute desquamative nephritis it must be employed with great caution. As an *expectorant* it has been given in *bronchitis* and *asthma* and, with varying success, in *croup* and *diphtheria.* To stimulate the growth of hair in *alopecia*, pilocarpine may be administered internally or hypodermically, and applied locally as well, and it has been employed hypodermically with success to arrest severe and prolonged hiccough.

It should *not be given* in diseases of the gastro-intestinal mucous membrane, nor in weak heart due to cardiac disease.

What are the officinal preparations of pilocarpus and their doses?

EXTRACTUM PILOCARPI FLUIDUM (*fluid extract of pilocarpus*), dose fʒss–j (2.0–4.0).

PILOCARPINÆ HYDROCHLORAS (*pilocarpine hydrochlorate*), dose gr. $\frac{1}{8}$–ss (0.008–0.032). It is well adapted to hypodermic use.

ORDER III.—EXPECTORANTS.

What are expectorants?

Expectorants are remedies which are given to modify the secretions of, and promote their expulsion from, the air passages.

How may they be classified?

They are divided into sedative and stimulating expectorants?

SEDATIVE EXPECTORANTS.

What are sedative expectorants?

They are remedies which increase the secretion and at the same time tend to lower the blood pressure, cause nausea and, if frequently repeated, vomiting.

Name the sedative expectorants.

Ipecac, apomorphine, tartar emetic, pilocarpine, lobelia and grindelia. Of these ipecac and apomorphine have been discussed with the "*emetics*," tartar emetic with the "*sedatives*," pilocarpine with the "*diaphoretics*," and lobelia with the "*depresso-motors.*"

GRINDELIA.

What is grindelia?

Grindelia is the *leaves* and *flowering tops* of G. robusta and G. squarrosa (*Nat. Ord.* Compositæ). It appears to depress the motor nerves and muscles, and in large doses to slow the heart and reduce the blood-pressure. Toxic doses produce narcosis with dilated pupils. It is eliminated by the kidneys, increasing the flow of urine, and to some extent by the broncho-pulmonary mucous membrane. It has been highly recommended in *spasmodic* and *cardiac asthma*, in *hay asthma* and *hay fever*, in *whooping-cough* and in *acute* and *chronic bronchitis.* In *chronic cystitis* it has been advantageously employed, and as a *local* application in *vaginitis* and in *poisoning* by rhus toxicodendron has met with some success. Dose of the *fluid extract* (*extractum grindeliæ fluidum*) ♏x–fʒj (0.6–4.0).

STIMULATING EXPECTORANTS.

What are stimulating expectorants?

They are remedies which probably modify the secretion by toning up the broncho-pulmonary mucous membrane through which they are eliminated. Most of them seem to exert an alterative effect in passing through the membrane, and many of them elevate the arterial tension.

Name the stimulating expectorants.

Ammonium chloride, senega, quillaja, quebracho, asclepias, eriodictyon, garlic, sanguinaria, ammoniac, benzoin, Peruvian balsam, balsam of Tolu, squill, eucalyptus, serpentaria, turpentine, tar, terpin hydrate, and terebene.

AMMONII CHLORIDUM—AMMONIUM CHLORIDE.

What is ammonium chloride?

Ammonium chloride, called also *ammonium muriate* or *sal ammoniac*, is a crystalline salt obtained from gas liquor.

What are its effects and uses?

Locally it is irritant. In medicinal doses it is believed to influence especially the mucous membranes, promoting very decidedly nutritive changes and hastening epithelial exfoliation. When given continuously for a length of time it diminishes the solids of the blood and stimulates the secretions. It is supposed to stimulate the hepatic functions, for the amount of urea excreted is greatly increased, as are all the other solids of the urine except uric acid. Large doses are purgative. It is used as a *stimulating* and *alterative expectorant* in the moist stage of *acute* and in *chronic bronchitis*, in *pneumonia* and the various *catarrhs* of children. Abroad it is employed also in *gastric* and *intestinal catarrhs*, in *chronic hepatitis* and in the early stages of *hepatic cirrhosis*. In cases of *albuminoid liver*, *spleen* or *kidneys* it is very useful. In subacute *muscular rheumatism* and in *neuralgia*, especially ovarian, it is advantageous, and it has been used internally as an alterative and employed locally as a sorbefacient in scrofulous *adenitis* of *the cervical glands*, and *uterine fibroid tumors*.

Dose gr. x–xxx (0.6–2.0). The unpleasant taste may be partially disguised by liquorice. The *troches* (*trochisci ammonii chloridi*) each contain about gr. ij (0.1) of the salt.

SENEGA.

What is senega?

Senega is the *root* of Polygala Senega or senega snake-root (*Nat. Ord.* Polygaleæ) and contains *polygalic acid* or *senegin*, a glucoside identical with *saponin*.

What are its effects and uses?

Locally, it is an irritant. *Internally*, it stimulates the mucous membranes, and in large doses is emetic and cathartic. It is given as a *stimulating expectorant* in the latter stages of acute and in subacute and chronic *bronchitis*, especially when the mucous membranes are wanting in tone. It has also been used as an emmenagogue in *amenorrhœa* and as a *diuretic* in dropsies. Dose of the *fluid extract* (*extractum senegæ fluidum*) ♏x–xx (0.6–1.2); of the *syrup* (*syrupus senegæ*) f℥j–ij (4.0–8.0). It is an ingredient of the *compound syrup of squill.*

QUILLAJA.

What is quillaja?

Quillaja, or soap-bark, is the *inner bark* of Q. Saponaria (*Nat. Ord.* Rosaceæ), a S. American tree, containing *saponin*, which foams like soap when in infusion. *Locally*, *saponin* is an irritant and protoplasmic poison. Given *internally* in sufficient doses it is a nerve and muscle poison, and completely antagonizes the effects of digitalis on the heart, which it paralyzes in diastole. It increases the secretion of bronchial mucus. Quillaja has been *used* as an *expectorant* in *chronic bronchitis*, *emphysema*, and *dilated bronchi.* It is also used to aid in emulsifying oils. Dose of the *tincture* (*tinctura quillajæ*) ♏xv–xxx (0.9–2.0).

ASPIDOSPERMA.

What is aspidosperma?

Aspidosperma, or *Quebracho*, is the *bark* of A. Quebracho-blancho (*Nat. Ord.* Apocynaceæ). It contains 5 alkaloids, *aspidospermatine* (which is believed to represent the entire virtues of the bark), and *aspidospermine*, *quebrachine*, *hypoquebrachine*, and *quebrachamine.* It has been used in *dyspnœa* independent of cause, but as it appears to have no action on the heart or kidney it probably is of service only in *bronchial asthma* and *emphysema.* It has also been used as a *bitter tonic.* Dose of the *fluid extract* (*extractum aspidospermatis fluidum*) ♏xv–f℥j (1.0–4.0).

ASCLEPIAS.

What is asclepias?

Asclepias, or *pleurisy root*, is the *root* of A. tuberosa (*Nat. Ord.* Asclepiadeæ). It is an *expectorant*, *diaphoretic*, and *diuretic*, and causes considerable cardiac depression. In large doses it is a *gastro-intestinal irritant.* It is but little used. Dose of the *fluid extract* (*extractum asclepiadis fluidum*) ♏xv–xxx (1.0–2.0).

ERIODICTYON.

What is eriodictyon?

It is the *leaves* of E. glutinosum, or California tar-bush (*Nat. Ord.* Hydrophyllaceæ), and is known also as *yerba santa.* It is used as an *expectorant* in *chronic pulmonary disorders*, and as a *vehicle* (in the form of elixir) to disguise the taste of quinine and other bitter drugs. Dose of the *fluid extract* (*extractum eriodictyi fluidum*) ♏xx–fʒj (1.2–4.0).

ALLIUM—GARLIC.

What is garlic?

Garlic is the *bulb* of Allium sativum (*Nat. Ord.* Liliaceæ) and contains a very volatile *oil.* *Locally* applied it is a rubefacient. Taken *internally* it is a condiment, stimulating digestion, increasing the secretions generally, especially the broncho-pulmonary, and quickening the circulation. It is *used* as a *stimulating expectorant* in subacute and chronic *bronchitis* and in *acute bronchitis of infants*, especially when the disease begins to assume the capillary form. Externally it is used as a counter-irritant in the above diseases, and in infantile convulsions, applied to the spine, legs and feet in the form of a poultice. Dose of the *syrup* (*syrupus allii*) fʒj (4.0) for a child.

SANGUINARIA.

What is sanguinaria?

Sanguinaria or blood-root, the *rhizome* of S. canadensis (*Nat. Ord.* Papaveraceæ), contains an alkaloid, *sanguinarine.* It is a *local* irritant. *Large doses* cause vomiting with great depression, a slow, irregular pulse (from direct action on the heart) and lowered blood-pressure, dilated pupil, collapse and death from paralysis of the respiratory centre, sometimes preceded by convulsions of spinal origin and lowered reflex activity. *Moderate doses* increase the arterial pressure from stimulation of the vaso-motor centres, which are paralyzed by larger doses. It stimulates the liver, the mucous membranes and the salivary and intestinal glands. It is used chiefly as a *stimulating expectorant* in lingering cases of *bronchitis.* Dose of the *tincture* (*tinctura sanguinariæ*) ♏v–xxx (0.3–2.0); of the *fluid extract* (*extractum sanguinariæ fluidum*) ♏ij–v (0.12–0.3). *Sanguinarine* (not official) has also been used as an expectorant in the dose of gr. $\frac{1}{12}$–$\frac{1}{8}$ (0.005–0.008).

AMMONIACUM—AMMONIAC.

What is ammoniac?

Ammoniac is a *gum-resin* obtained from Dorema Ammoniacum (*Nat Ord.* Umbelliferæ). It is used internally as a *stimulating expectorant* in *chronic bronchitis* and in *bronchorrhœa*, and locally as a *counterirritant.* Dose gr. x–xxx (0.6–2.0); of the *emulsion* (*emulsum ammoniaci*—formerly called *the mixture*, Pharm. 1880) fʒss (15.0). A *plaster* is official (*emplastrum ammoniaci cum hydrargyrô—plaster of ammoniac with mercury*).

BENZOINUM—BENZOIN.

What is benzoin?

Benzoin, a *balsamic resin* obtained from Styrax Benzoin, or Benjamin tree (*Nat. Ord.* Styraceæ) contains *benzoic acid*, *resin*, *volatile oil*, and often *cinnamic acid.*

The effects of benzoin are due to *benzoic acid* (*v.* "*Antiseptics*"). *Locally* it is an irritant. Internally it stimulates the broncho-pulmonary and genito-urinary mucous membrane. It is eliminated chiefly by the urine as hippuric acid, increasing the acidity of that excretion.

It is chiefly *used* by inhalation (compound tincture ℥j(4.0), in a cupful (120.0) of boiling water,) in *laryngitis*, or to quiet spasmodic laryngeal cough, as in influenza. It has also been employed internally in *chronic bronchitis* and in *chronic cystitis with alkaline urine and phosphatic deposits*, but for the latter purpose benzoic acid or its salts are preferred. It is added to ointments to prevent rancidity, and is much employed in the form of fumigating pastilles. It is also used locally as an *antiseptic and protective* (*compound tincture*) in *fissured nipple*, *chapped hands*, and *fissure of the anus*, and has even been employed as a substitute for carbolic and salicylic acids, for its antiseptic effects, in the *treatment of wounds.* Dose of the *tincture* (*tinctura benzoini*) fʒss–j (2.0–4.0); of the *compound tincture* (*tinctura benzoini composita*) fʒss–ij (2.0–8.0).

Benzoinated lard (*adeps benzoinatus*) contains 2 per cent. of benzoin.

BALSAMUM PERUVIANUM—BALSAM OF PERU. BALSAMUM TOLUTANUM—BALSAM OF TOLU.

What are these substances?

BALSAM OF PERU is a *balsam* obtained from Toluifera Pereiræ (*Nat. Ord.* Leguminosæ), and contains *cinnamein*, *resin*, *benzalcohol*, *benzylic benzoate*, *stilbene*, and *cinnamic* and *benzoic acids*.

It is a stimulant and tonic to the mucous membranes, and has been used in various catarrhs. Dose fʒss (2.0) in emulsion.

BALSAM OF TOLU is a *balsam* obtained from Toluifera Balsamum (*Nat. Ord.* Leguminosæ) and contains *resins*, *benzylic benzoate* and *cinnamate*, *tolene*, and *cinnamic* and *benzoic acids*. Its effects and uses are similar to those of balsam of Peru, to which it is preferred because of its more pleasant taste. Dose gr. x–xxx (0.6–2.0) in emulsion, every few hours. It is, however, principally used as a vehicle. Dose of the *tincture* (*tinctura tolutani*) is fʒj–ij (4.0–8.0); of the *syrup* (*syrupus tolutanus*) fʒj–iv (4.0–15.0). It is also an ingredient of the *compound tincture of benzoin.*

PIX LIQUIDA—TAR.

What is tar?

Tar is an *empyreumatic oleoresin* obtained by destructive distillation of the wood of Pinus palustris and other species of P. (*Nat. Ord.* Coniferæ). When distilled it yields *pyroligneous acid*, *oil of tar*, and a black residuum known as *pitch*. The *oil of tar* contains *creasote*. Tar resembles turpentine in its effects on the mucous membranes, but is more *antiseptic*. *Externally* it is an *irritant*. It is used as a *stimulating expectorant* in the later stages of *acute bronchitis*, particularly where the disease does not yield readily to other treatment, and in *chronic bronchitis*. *Externally* it is employed in *chronic skin diseases*, especially in squamous affections.

Tar-water (not official) may be given in doses of f℥ss–j (15.0–30.0) or the syrup (*syrupus picis liquidæ*), which is better, in doses of f℥ss (15.0). *Locally*, the *oil* (*oleum picis liquidæ*) is used as a substitute for "oil of cade" (*oleum cadinum*), which is also official, or the *ointment* (*unguentum picis* liquidæ) may be applied.

TERPINI HYDRAS—TERPIN HYDRATE.

What is terpin hydrate?

It is the *hydrate* of the diatomic alcohol *terpin*. It occurs in colorless, rhombic, lustrous prisms; is odorless, but has a slightly aromatic, rather bitter taste.

It *acts* on the *nervous system* and on *mucous membranes* in a manner similar to turpentine. It is eliminated by the urine, to which it imparts a turpentine odor. When given in large doses or for a long time, it may cause strangury, albuminuria, or even hæmaturia.

From its stimulating influence on mucous membranes it has been much *used* as an *expectorant* in *bronchitis*, either acute or chronic, especially when the secretion is very free.

It has also been used in *cystitis*, in *gonorrhœa*, and in *chronic kidney disease*. Dose gr. j–iij (0.06–0.2) every 4 hours, in pill or capsule.

TEREBENUM—TEREBENE.

What is terebene?

Terebene is a liquid consisting chiefly of *pinene*, and containing not more than very small proportions of terpinene and dipentene, and is prepared by gradually adding sulphuric acid to the oil of turpentine. In its general effects it resembles turpentine. It is a good *stimulating expectorant*, very useful in the declining stages of *acute* and *chronic bronchitis*. It is also useful in *emphysema*, *phthisis*, and *pleurisy*. In *fetid bronchitis* and *bronchiectasis* it is very efficacious. It has also been employed in *flatulent dyspepsia* and *genito-urinary inflammations*. Dose ♏v–xx (0.3–1.2) in capsule or emulsion t. i. d., or its vapor may be inhaled diluted with steam.

What substances are often used as expectorants which have been previously considered in other medicinal groups?

Squill and turpentine (*v.* "*Diuretics*"), eucalyptus, serpentaria, and Prunus Virginiana (*v.* "*Aromatic Bitters*").

ORDER IV.—ASTRINGENTS.

What are astringents?

Astringents are remedies employed to cause contraction of the *tissues with which they* come in contact and thus lessen secretion.

For what purposes are they used?

They are used to check profuse secretion (*e. g.*, ptyalism, etc.) or morbid discharges (*e. g.*, diarrhœa), to overcome relaxation of the tissues, and as hæmostatics and styptics.

How may the astringents be classified?

They are divided into vegetable and mineral astringents.

Vegetable Astringents.

What are the vegetable astringents?

They are tannic and gallic acids, and the various plants which are used as astringents on account of containing these principles.

Name the vegetable astringents.

Tannic acid, gallic acid, nutgalls, catechu, kino, krameria, hæmatoxylon, white-oak, geranium, witch-hazel, red and white rose, sumach, chestnut leaves.

ACIDUM TANNICUM—TANNIC ACID.

What is tannic acid?

Tannic acid (*gallo-tannic acid—digallic acid*) is an *organic acid* obtained from nutgall. It is widely distributed throughout the vegetable kingdom and exists under two forms, *gallo-tannic acid* (which is the official variety and strikes a blue-black color with the ferric salts) and *kino-tannic acid* (which produces a greenish-black color with the same salts). Gallo-tannic acid is a light yellowish, amorphous powder, usually cohering in the form of glistening scales or spongy masses, without smell, but having a strongly astringent taste.

It is freely soluble in water and in alcohol, and may readily be dissolved in glycerin by the aid of moderate heat.

What are its physiological effects?

Tannic acid is a powerful astringent, coagulating albumins, contracting blood-vessels and constringing tissues with which it comes in contact. It checks the secretions of the alimentary canal when taken internally, and restrains peristalsis, thus tending to constipate. It is converted into an alkaline tannate and into gallic acid in the prima via and slowly absorbed. It is eliminated by the fæces and urine under *its own* form and as gallic and pyrogallic acids.

For what purposes is it used in medicine?

When *remote* astringent effects are desired gallic acid is preferable, but tannic acid is employed whenever the part to be acted on is so situated that the drug can come in direct contact with it. Thus, it is given to *arrest morbid discharges* from the bowels in *diarrhœa* and *dysentery*, both internally and by enema, and is used externally for the same purpose in *leucorrhœa*, *gleet*, *colliquative sweating*, and as an application to *chronic ulcers*. To *counteract relaxation of tissues* it is employed in the treatment of *spongy gums*, *chronic pharyngitis* and *laryngitis*, *mercurial stomatitis* and hemorrhoids. It is used also to *arrest hemorrhages* from the nose, gums, pharynx, stomach and bowels, and locally as a styptic; to *harden tissues* subjected to pressure, as in threatened bed-sores and tender feet, and as an *antidote* to *antimony* and other metallic poisons.

Dose, in diarrhœa, gr. j–xv (0.06–1.0) in pill; in hemorrhage, gr. v–xx (0.3–1.3) in powder. The *troches* (*trochisci acidi tannici*) each contain gr. j (0.06), and may be used in relaxed palate or sore throat.

The *ointment* (*unguentum acidi tannici*) or the *glycerite* (*glyceritum acidi tannici*), a solution in glycerin, may be used locally.

ACIDUM GALLICUM—GALLIC ACID.

What is gallic acid?

Gallic acid is an *organic acid*, usually prepared from *tannic acid*, and is tannic acid + a molecule of water; thus, $HC_{14}H_9O_9$ (tannic acid) + $3H_2O = 2(HC_7H_5O_5 + H_2O)$ (gallic acid). It occurs as white or pale fawn-colored, silky, interlaced needles or triclinic prisms; odorless, having an astringent or slightly acidulous taste. It is very soluble in boiling alcohol and boiling water, less so in cold alcohol, glycerin, ether, or cold water. It does not coagulate albumin, and hence is not as efficacious as a local astringent, but is preferred to tannic acid when it is desirable that the astringent should be absorbed and act through the blood on some remote part. It is used as a *hemostatic* in *hemoptysis*, *hematuria*, and *uterine hemorrhage*. It is also employed to *lessen secretion*, as in *colliqu* *ents* *and bronchorrhœa*, and to *check morbid disch* *minuria*. *Dose gr.* v–xxx (0.3–2.0), in p

Describe the preparations, doses, and uses of the vegetable astringents which owe their virtues to tannic and gallic acids.

GALLA (*nutgall*) is an *excrescence* found on Quercus lusitanica, the gall oak (*Nat. Ord.* Cupuliferæ) caused by the punctures and deposited ova of a fly (Cynips Quercûs folii or Diplolepis Gallæ tinctoriæ). Before the maturity of the larvæ and their escape from the gall, they contain *tannic acid* (50–60 per cent.) and *gallic acid* (3 per cent.); afterward they are much inferior and contain comparatively little of these substances.

They are but little used except as the source of tannic and gallic acids. The *tincture* (*tinctura gallæ*) is chiefly used as a chemical test. The *ointment* (*unguentum gallæ*) combined with powdered opium is sometimes applied to hemorrhoids.

CATECHU, an *extract* prepared from the *wood* of Acacia Catechu (*Nat. Ord.* Leguminosæ), contains *kino-tannic* and *catechuic acids* (*catechin*). It is a powerful astringent, much used in *diarrhœas* and to some extent in *hemorrhages*, and locally as an *astringent* in sore throat, as an injection in *gonorrhœa* and *leucorrhœa*, and as a *styptic*. Dose gr. x–xxx (0.6–2.0) in emulsion or capsules. Of the *compound tincture* (*tinctura catechu composita*) fʒj–iij (4.0–12.0) may be given. The *troches* (*trochisci catechu*) each contain gr. j (0.06).

KINO, the *inspissated juice* of Pterocarpus Marsupium (*Nat. Ord.* Leguminosæ) and other trees; contains *kino-tannic acid*, *kinoïn*, *pyrocatechin*, etc., and has similar properties and uses to catechu. Dose of the powder gr. x–xxx (0.6–2.0); of the *tincture* (*tinctura kino*) fʒj–ij (4.0–8.0).

KRAMERIA, the *root* of K. triandra and of K. Ixina (*Nat. Ord.* Polygaleæ), S. American shrubs; contains *kramero-tannic acid*, and is a powerful astringent, similar to kino and catechu. Dose of the *extract* (*extractum krameriæ*) gr. v–xv (0.3–1.0); of the *fluid extract* (*extractum krameriæ fluidum*) fʒss–j (2.0–4.0); of the *tincture* (*tinctura krameriæ*) fʒss–ij (2.0–8.0); of the *syrup* (*syrupus krameriæ*) fʒj–jv (4.0–15.0). The *troches* (*trochisci krameriæ*) each contain gr. j (0.06).

HÆMATOXYLON, logwood or Campeachy wood, is the *heart wood* of H. campeachianum (*Nat. Ord.* Leguminosæ), containing *tannic acid*, *hæmatoxylin*, etc. It is a good astringent in diarrhœas due to relaxation, especially in children, but the discharges will stain the linen blood-red. Of the *extract* (*extractum hæmatoxyli*) the dose is gr. x–xxx (0.6–2.0).

QUERCUS ALBA, or white oak (*Nat. Ord.* Cupuliferæ). The *bark* is official, and contains *querci-tannic acid.* It is occasionally used in *diarrhœas*, but more often as an enema in *hemorrhoids* and *prolapsus ani*, or as a vaginal wash in *leucorrhœa* or relaxed conditions with tendency to cystocele or rectocele. It makes an indelible stain on linen.

GERANIUM, the *rhizome* of G. maculatum, crow's foot or crane's bill (*Nat. Ord.* Geraniaceæ); contains *tannic* and *gallic acids*, and is an efficient indigenous astringent. Dose of the *fluid extract* (*extractum geranii fluidum*) f ʒss–j (2.0–4.0).

HAMAMELIS, the *leaves* of H. virginica or witch hazel (*Nat. Ord.* Hamamelaceæ); contains *tannic acid* and a *bitter principle.* It is an astringent and seems to contract the veins of the skin and mucous membranes. It has been used in passive hemorrhages as a hemostatic, as an astringent enema in hemorrhoids, and locally in congestions and inflammations. Dose of the *fluid extract* (*extractum hamamelidis fluidum*) f ʒss–j (2.0–4.0).

ROSA GALLICA (*red rose*); ROSA CENTIFOLIA (*pale rose*), (*Nat. Ord.* Rosaceæ). Their *petals* are official. The former is a very mild astringent, but they are principally used as flavoring ingredients and vehicles. The preparations of red rose are a *fluid extract* (*extractum rosæ fluidum*), a *honey* (*mel rosæ*), a *syrup* (*syrupus rosæ*) and a *confection* (*confectio rosæ*); those of pale rose are a *triple or stronger rose water* (*aquæ rosæ fortior*), and another milder *water* (*aquæ rosæ*) from which is made an *ointment* (*unguentum aquæ rosæ—cold cream*).

RHUS GLABRA (*sumach*) (*Nat. Ord.* Anacardieæ is official. It is a good astringent in sore mouth and pharyngitis. The *fluid extract* (*extractum rhoïs glabræ fluidum*) may be diluted with two or more parts of water and used as a gargle.

CASTANEA, the *leaves* of C. dentata or chestnut (*Nat. Ord.* Cupuliferæ), is astringent and supposed to possess antispasmodic properties. It is chiefly used in whooping-cough. Dose of the *fluid extract* (*extractum castaneæ fluidum*) f℥ss–ij (2.0–8.0).

MINERAL ASTRINGENTS.

Name the mineral astringents.

Most of the metallic salts possess astringent properties, but those especially used for this purpose are the lead salts; alum; aluminium sulphate; the salts of copper, of zinc, of silver, and of bismuth; and cerium oxalate.

PLUMBUM—LEAD.

What is the source of lead?

Lead is obtained by roasting *galena*, the native sulphide.

What are its physiological actions?

Metallic lead is inert, as are probably also the *sulphide* and *sulphate*. *All other salts of lead*, when *applied locally* in solution, are astringent, or if the solution be strong, irritant. In medicinal doses they are astringent to the alimentary canal, decreasing its secretions and also the secretion of bile. They are but slowly absorbed. When taken for some time they reduce the volume and frequency of the pulse by stimulation of the cardio-inhibitory centre and the peripheral filaments of the vagi. They are *eliminated* by the liver and kidneys.

What are its toxicological actions?

In large doses several of the lead salts are capable of causing *acute poisoning*, the symptoms being intense gastro-intestinal irritation, vomiting, coma, paralysis and collapse.

Chronic poisoning is caused by saturation of the system with lead, either by drinking pure water conveyed in lead pipes (the contained air forming a soluble oxide), constantly eating substances adulterated with lead salts, exposure in lead factories, etc. Lead colic (or painters' colic), the most common form, consists of sharp pains about the umbilicus, obstinate constipation, hard, contracted abdomen, and often nausea and vomiting. This is probably due to intense stimulation of the intestinal ganglia by the lead, causing arrest of peristalsis and spasm of the muscular coat of the bowel. It is quickly relieved by belladonna, atropine or pilocarpine. Sometimes the poisoning takes the form of *lead-arthralgia*, manifesting itself by severe pain in the joints and limbs, and cramps.

Lead paralysis is loss of voluntary motion in groups of muscles, particularly the flexors of the upper extremity, causing *wrist-drop.* Electro-muscular contractility is affected, the muscles waste, and often anæsthesia of the affected or opposite side is present. The poison may also affect the brain, kidney, or other organs. An important symptom of lead poisoning is a *blue line upon the gums where they join the teeth*, and in case of doubt lead may be detected in the urine by the chemical tests.

What are the tests for lead, and how should saturnine poisoning be treated?

Sulphuretted hydrogen gives a *black*, and a solution of *potassium iodide* a *yellow precipitate* with soluble lead salts. The *treatment* of *acute poisoning* consists in evacuating the contents of the stomach, and administering diluted sulphuric acid, or sodium or magnesium sulphate as a chemical antidote. In *chronic poisoning*, discover its source and remove it (in the case of painters, insist on scrupulous cleanliness of the hands and nails, and the use of very diluted sulphuric acid as a drink); give purgatives to overcome the resulting constipation; give diluted sulphuric acid or the soluble sulphates, with baths of potassium sulphide as antidotes, and aid elimination by large quantities of diluents and potassium iodide. In *lead colic* atropine is of service, and in *lead palsies* electricity (the faradaic current when the muscles respond) and strychnine are advantageously employed.

For what medicinal purposes are the lead salts used?

They are used *internally* as *astringents* in *diarrhœas* and *dysenteries, as hemostatics*, and in the treatment of *internal aneurism. Locally, as astringent injections* in *leucorrhœa* and *gonorrhœa*, and as *sedative* and *astringent lotions* in *inflammations.* The *acetate* is the only lead salt which is administered internally.

What are the preparations of lead and their uses?

Plumbi Oxidum (*lead oxide*), or *litharge*, is occasionally used as a dusting powder for ulcers, but is chiefly employed to make a *plaster* (*emplastrum plumbi*), which is the basis for most officinal plasters; *diachylon ointment* (*unguentum diachylon*), useful in skin diseases, and *soap-plaster* (*emplastrum saponis*).

Plumbi Acetas (*lead acetate*), or *sugar of lead*, is used *internally* as an *astringent* in *diarrhœa*, often combined with opium, and is also useful in *dysentery*. To lessen the expectoration in *chronic bronchitis* and to check the *night sweats of phthisis* it is sometimes given. As a *hemostatic* in yellow fever it does some good, and perhaps also in *hemoptysis.* It has been employed as a *sedative* in the treatment of internal *aneurism.* *Locally* as a *sedative* and *astringent* lotion it is much used in inflammations (not applicable to ocular therapeutics, as it may cause corneal opacity), and to check morbid discharges. Dose gr. j–viij (0.06–0.5) two or three times a day. As an injection in gonorrhœa gr. ss–ij (0.03–0.12)–f℥j (30.0); as a lotion in inflammation gr. v–x (0.3–0.6)–f℥j (30.0).

Liquor Plumbi Subacetatis (*solution of lead subacetate—Goulard's extract*) contains about 25 per cent. of lead subacetate in solution, and is used externally and in the preparation of *lead water* (*liquor plumbi subacetatis dilutus—diluted solution of lead subacetate*), which contains 3 per cent. of the stronger solution; and of *Goulard's cerate* (*ceratum plumbi subacetatis—cerate of lead subacetate*).

Plumbi Iodidum (*lead iodide*). It may be used internally, dose gr. ij–iij (0.13–0.19), but is chiefly employed externally in the form of *ointment* (*unguentum plumbi iodidi*), which contains 10 per cent. of the salt.

Plumbi Nitras (*lead nitrate*) is used as a disinfectant (*Ledoyen's disinfecting fluid* contains ʒj to the f℥j—about 4.0 to 30.0), astringent and sedative, in wounds, ulcers, cracked nipples, onychia maligna, etc.

Plumbi Carbonas (*lead carbonate—white lead*) is used chiefly as application to *fresh burns.* If applied to a large surface, care should be taken to guard against poisoning. An *ointment* (*unguentum plumbi carbonatis*) is official, and contains 10 per cent. of the carbonate.

ALUMEN—ALUM.

What is alum?

Official *alum* is a double sulphate of aluminum and potassium. There are other varieties in which potassium is replaced by some other base, as ammonium or sodium.

What are its effects and uses?

Alum is a powerful astringent, and in large quantity an irritant, whether used locally or internally. In large doses it is emetic, and in excessive doses has caused death from gastro-intestinal irritation. It is *used* in solution as an *astringent*, by atomization in *bronchorrhœa*, by injection in *leucorrhœa*, *gonorrhœa* and *gleet*, as a gargle in *sore-throat*, *relaxed palate* and *uvula*, as a lotion in *conjunctivitis* and on cotton as a tampon in *cystocele*, *rectocele* and *uterine prolapse.* As a *hemostatic* in *hemoptysis*, a saturated solution may be used by atomization; and as a *styptic* (*aqua pagliari* consists of alum, compound tincture of benzoin and water boiled together) it is employed locally to arrest hemorrhage. As an *emetic* it is used in *croup* in *capillary bronchitis* and as an adjuvant to other emetics. It is also efficient in the treatment of *lead colic.* Dose as an *astringent* gr. x–xxx (0.6–2.0); as an *emetic* ʒj–iv (4.0–16.0). In lead-poisoning a teaspoonful (4.0) may be given every 3 or 4 hours.

Dried alum (*alumen exsiccatum*) is alum deprived of its water of crystallization by heat. In excessive doses it has proved fatal. Dose gr. v–x (0.3–0.6). Externally it is applied as a mild escharotic to fungous granulations.

ALUMINI SULPHAS—ALUMINUM SULPHATE.

What is aluminum sulphate?

It is a powerful *astringent* and *antiseptic*, and is employed for *these purposes externally* and as an *injection in gonorrhœa.* Its *solution has been* used to preserve cadavers for dissection.

CUPRUM—COPPER.

What are the sources and the effects of copper?

Copper is obtained from copper pyrites, a double sulphide of iron and copper. *The metal* itself is inert. *The salts* are mild *astringents* and *stimulants* when in weak solution, and when strong, act as *irritants;* in powder they are mild *caustics.* Taken *internally in small doses* they are astringent, and are supposed to act as tonics to the nervous system. In *larger doses* they are local *emetics.* In *excessive amounts* they act as *irritant poisons*, causing gastro-intestinal inflammation, hæmaturia, sometimes jaundice, convulsions, paralysis, delirium, coma and death. The *post-mortem* reveals fatty degeneration of the liver and decomposition of the blood corpuscles. When taken continuously for a *very long time* a condition of chronic poisoning results, with giddiness, occasional diarrhœa, cramps, wasting, and sometimes progressive palsies, respiratory failure and death. A *green line* is sometimes observed on the gums.

The *tests* for the soluble copper salts are *potassium ferrocyanide*, which gives a mahogany-colored precipitate; *ammonia*, which gives a beautiful blue color, and *metallic iron* on which metallic copper will be deposited from a solution. The treatment of *acute poisoning* is albumen (milk or eggs); opium, demulcents and treating symptoms as they arise. In *chronic poisoning*, endeavor to eliminate it as if the poison were lead.

For what purposes is copper used in medicine?

It is used *internally* as an *astringent* in *chronic diarrhœa*, especially when ulceration exists, as an *emetic* (the sulphate), especially in narcotic poisoning, and occasionally as a *tonic* in nervous debility and functional nervous diseases. *Locally* it is efficacious as a *stimulant* to ulcers, as an *escharotic* in granular conjunctivitis and flabby granulations, and as an *astringent* injection in gonorrhœa.

What are the preparations of copper and their doses?

Cupri Sulphas (*copper sulphate*) called also *blue vitriol*, or *blue stone.* Dose as an *astringent* gr. ¼–j (0.01–0.06), in pill; as an *emetic* gr. iij–v (0.2–0.3); as an injection in gonorrhœa gr. ¼–j (0.01–0.06) to f℥j (30.0).

ZINCUM—ZINC.

What are the sources, action, uses and preparations of zinc?

Zinc is obtained principally from the native carbonate and sulphide. The *effects* of the *zinc salts* are similar to those of copper, but are less powerful. In *excessive doses* they cause an *acute poisoning* very similar to that produced by copper, the *antidotes* being milk and eggs, alkalies and their carbonates. *Chronic poisoning* is so rare as to be disputed. The *test* for zinc in solution is the addition of *ammonium sulphide*, which precipitates *white* zinc sulphide, the only white sulphide met with.

They are used as *astringents* in diarrhœas; as *emetics;* as *nerve tonics* in epilepsy and chorea, and locally as *astringents* in conjunctivitis, gonorrhœa, etc.; as *sedatives* and *astringents* in eczema and erysipelas; as *dusting powders*, and as mild *stimulants* to ulcers.

ZINCI SULPHAS (*zinc sulphate—white vitriol*), dose as a *tonic* or *astringent* gr. ij–v (0.13–0.3); as an *emetic* (safer than copper sulphate) gr. x–xx (0.6–1.3). Locally, as a collyrium or as an injection in gonorrhœa, gr. j–ij (0.06–0.13) to f℥j (30.0).

ZINCI OXIDUM (*zinc oxide*) used internally in *catarrhal diarrhœa*, *membranous enteritis*, *epilepsy*, *chorea*, and occasionally to check *colliquative sweats*. Dose gr. j–v (0.06–0.3) in pill. It is used also as a *dusting powder*.

Oleatum zinci (*oleate of zinc*) contains 5 per cent. of zinc oxide, and is used externally.

The *ointment* (*unguentum zinci oxidi*) contains 20 per cent. of the salt and is much employed.

Impure or *commercial zinc oxide*, sometimes called "*tutty*," is used in pharmacy.

ZINCI ACETAS (*zinc acetate*) is used as a *collyrium* (gr. ij (0.13) to f℥j (30.0)) as an injection in the third stage of *gonorrhœa* (gr. j–xx (0.06–1.3) to f℥j (30.0)) and in *leucorrhœa* (ʒj to Oj—about 4.0 to 473.0).

ZINCI CARBONAS PRÆCIPITATUS (*precipitated zinc carbonate*) is used as a *dusting powder* and a mild *astringent* ointment (ʒj–℥j —about 4.0 to 30.0).

ZINCI CHLORIDUM (*zinc chloride*) is a powerful *caustic* and *antiseptic*, employed to destroy lupus and indolent granulations. It is used also to preserve cadavers for dissection. Burnett's disinfecting fluid contains gr. 200 to f℥j (about 13.0 to 30.0).

Liquor zinci chloridi (*solution of zinc chloride*) may be used to disinfect water-closets and sinks.

ZINCI IODIDUM (*zinc iodide*) is a local stimulant and caustic.

ZINCI VALERIANAS (*zinc valerianate*) is employed as *a nerve tonic* in epilepsy and chorea; dose gr. j–ij (0.06–0.13) t. i. d.

ZINCI BROMIDUM (*zinc bromide*) is also official.

ZINCI PHOSPHIDUM (*zinc phosphide*) has been mentioned under phosphorus (*vid. Mineral Tonics*).

ARGENTUM—SILVER.

What are the physiological effects of silver?

Metallic silver is inert. Of its soluble salts, the oxide and nitrate are chiefly employed. *Locally* applied *the nitrate* coagulates albumen, is an astringent and superficial caustic, contracting the cutaneous vessels and producing a white stain on the skin which becomes black on exposure to light. Taken *internally* they are astringent, and after absorption exert a tonic influence upon the nervous system. In *large doses* they are gastro-intestinal irritants, often producing also violent convulsions, disturbed respiration, coma, dilated pupils, paralysis and death from respiratory failure. If *too long continued*, even in minute doses, *chronic argyria* results, consisting in emaciation, impaired memory and a peculiar indelible *blue discoloration*, first manifesting itself on the mucous membranes, and extending to the skin and internal organs.

What are the tests for silver, and how should argyria be treated?

The addition of *hydrochloric acid* or *sodium chloride* to a solution of silver produces a white precipitate of silver chloride, soluble in ammonia. *Acute argyria* is treated by giving immediately, as an *antidote*, a large amount of common salt, and treating symptoms p. r. n. In *chronic argyria* nothing does much good as a rule; potassium iodide may be tried as an eliminative agent.

What are the medicinal uses of the silver salts?

They are used as *astringents* in *chronic diarrhœas* and in *dysenteries* (internally or by enema) especially when ulceration is present, and are very useful in organic dyspepsias especially in *gastric ulcer* and in *chronic gastritis*. As a nerve tonic they are employed in *locomotor ataxia* and other *spinal scleroses*. ***Externally*** **as a *stimulant*** and *mild caustic* the nitrate is applied to slowly ***granulating** surfaces* or to unhealthy *ulcers*. As an *antiphlogistic* and ***astringent*** it is used in solution in various inflammations of the mucous membranes, as *conjunctivitis*, *pharyngitis*, *laryngitis*, etc., and may be used as an injection in the later stages of gonorrhœa (gr. j–ij (0.06–0.13) to f℥j (30.0)) in the male, or in *acute vaginitis* (painting the inflamed vagina with strong solutions). It is employed also in superficial inflammations of the skin, in erysipelas, and to prevent pitting in smallpox.

What are the official silver salts and their doses?

ARGENTI NITRAS (*silver nitrate*), dose gr. ⅛–¼ (0.008–0.016) gradually increased to gr. ss–j (0.032–0.06). Great care should be taken to prevent staining the skin. For external use solutions are employed varying in strength from gr. j–ʒij (0.06–8.0) to f℥j (30.0) of distilled water.

Moulded silver nitrate or *lunar caustic* (*argenti nitras fusus*) is silver nitrate melted and poured into small moulds, for external use.

Diluted silver nitrate (*argenti nitras dilutus*) is 30 parts of silver nitrate and potassium nitrate 60 parts, moulded as above.

ARGENTI OXIDUM (*silver oxide*), dose gr. ss–j (0.03–0.06) in pill.

ARGENTI IODIDUM (*silver iodide*), dose as an alterative gr. j (0.06).

ARGENTI CYANIDUM (*silver cyanide*), used for preparing diluted hydrocyanic acid.

BISMUTHUM—BISMUTH.

What are the actions, uses and preparations of bismuth?

Metallic bismuth is inert. The *less soluble salts* are not actively toxic when pure, as they are absorbed with difficulty. *Bismuth and ammonium citrate* is much more irritant, and may in large doses cause gastro-enteritis. In medicinal doses, they are astringent and sedative to the mucous membranes. A portion is absorbed and is eliminated by the kidneys chiefly, while that which is not absorbed is converted into a sulphide and colors the stools black. *Locally* applied they are antiseptic and sedative.

They are used internally as ***sedatives*** **and** heck nausea and vomiting in *gastric irritation*, and to relieve pain in *gastralgia*, *gastric ulcer* and *cancer*. In *acute diarrhœas* from irritation and in *chronic diarrhœas*, especially those occurring in children during the summer months, they are very valuable. *Externally* as mild astringents and antiseptics they are useful in the treatment of *ulcers*, and as an injection (suspended in mucilage) in acute *gonorrhœa* and in *vaginitis*. They are also used as dusting powders in *intertrigo* and as snuff in acute *coryza*.

Bismuth Subnitras (*bismuth subnitrate*) called also *pearl white* or *magistery of bismuth*, dose gr. v–ʒj (0.3–4.0).

Bismuthi Subcarbonas (*bismuth subcarbonate*), dose gr. v–xxx (0.3–2.0).

Bismuthi et Ammonii Citras (*bismuth and ammonium citrate*), dose gr. j–v (0.06–0.3).

CERII OXALAS—CERIUM OXALATE.

What is cerium oxalate?

It is supposed to resemble the salts of bismuth in its effects, but has not been investigated. It is *used* with success in *reflex vomiting*, particularly the *vomiting of pregnancy*. Dose gr. j–iij (0.06–0.19), t. i. d. in pill or capsule.

ORDER V.—Antacids.

What are antacids?

Antacids are remedies capable of neutralizing acids. The term, however, is here used in a more limited sense, and embraces only those medicines which are used in medicine to correct excessive acidity in the alimentary canal, as manifested by heartburn, acid eructations, gastric uneasiness, and diarrhœa of infants with "chopped spinach stools." Excessive acidity may be due to an excessive secretion of acid by the stomach, and here the antacids may be given after meals to neutralize the acid present, or the same effect may be produced by administering an acid before meals, which will decrease the acid secretion. On the other hand, it may be due to a deficient secretion of acid and consequent imperfect digestion and fermentation of the food. In these cases an antacid given before meals is useful by increasing the outward osmosis of acid, or a mixture of pepsin and acid after meals may supply the place of the deficient secretion. In acidity due to the development of the sarcina *ventriculi*, sulphurous acid, the sulphites, carbolic acid or other antizymotics give the best results.

Name the antacids employed for the above purposes.

While all of the alkalies, alkaline earths and their carbonates are really antacids, yet in medical practice the sodium and calcium salts are chiefly used. *Solution of potassa* (*q. v.*) is sometimes, but not often, employed. The *spirit* and *aromatic spirit of ammonia* (*q. v.*) are frequently used, especially in sick headache or where a stimulating antacid is required.

SODIUM.

What are the effects and uses of the sodium salts?

Caustic soda and its solution are escharotics. The ***sodium salts*** taken on an empty stomach increase the secretion of acid gastric juice, but if given after a meal in sufficient quantity they neutralize the acid present. They diffuse readily into the blood and act somewhat as do the potassium salts, being, however, less irritant, more feebly diuretic, and possessing little if any poisonous influence over the (mammalian) heart, nerves or muscles.

The medicinal uses of the sodium preparations have been considered in discussing the general uses of the antacids.

What are the preparations of sodium?

LIQUOR SODÆ (*solution of soda*), dose ♏ij–x (0.12–0.3) freely diluted.

SODII CARBONAS (*sodium carbonate*) is much used as an antacid in dyspepsia. In overdoses it is a corrosive poison. The antidotes are the vegetable acids. Dose gr. x–xxx (0.6–2.0). It is sometimes deprived of its water of crystallization and prescribed in pill form as the *dried carbonate* (*sodii carbonas exsiccatus*), in doses of gr. v–xv (0.3–1.0).

SODII BICARBONAS (*sodium bicarbonate*), is preferred to the carbonate because it is a more permanent salt and is less irritating to the stomach. Dose gr. x–xxx (0.6–2.0). It is an ingredient of *seidlitz powders* (*q. v.*) and other preparations. The ***troches*** (*trochisci sodii bicarbonatis*) each contain gr. iij (0.2) of the bicarbonate.

The other sodium salts are rarely used as antacids, and most of them have been sufficiently described previously.

CALCIUM.

What are the effects, uses and preparations of calcium?

Unslaked lime is a caustic. The *calcium salts* are antacid, slightly astringent and sedative to the mucous membranes, and are consequently much used in vomiting and in diarrhœa. The vapor arising from slaking lime is inhaled with advantage in membranous croup and in diphtheria. The preparations are LIQUOR CALCIS (*lime-solution—lime-water*), used as an antacid and gastric sedative in nausea and vomiting from irritability of the stomach, and often added to milk to increase its digestibility and render it more readily tolerated by the stomach. As an antacid and astringent it is useful in diarrhœa, especially in teething children. Locally it is used as an alkaline wash in various skin affections and as a dressing to burns, scalds, ulcers, etc., in the form of the *liniment* (*linimentum calcis*) often called *carron oil* (equal parts of lime-water and linseed oil).

SYRUPUS CALCIS (*syrup of lime*), a saturated, aqueous solution of calcium hydrate, the percentage of which varies with the temperature, but is about 0.17 at 59° F., is used as an astringent in diarrhœas and as an antidote to poisoning by carbolic acid. Dose fʒss–ij (2.0–8.0), freely diluted.

CALCII CARBONAS PRÆCIPITATUS (*precipitated calcium carbonate*) (dose gr. xx–ʒj (1.3–4.0)) possesses no especial advantage over *prepared chalk* (*cretæ præparata*), which is used in diarrhœas. Dose gr. x–xxx (0.6–2.0). They are used externally as dusting-powders in intertrigo. *Compound chalk powder* (*pulvis cretæ compositus*) contains 30 per cent. of prepared chalk. *Chalk mixture* (*mistura cretæ*) contains 20 per cent. of the compound powder in water and cinnamon water, and is much used, combined with astringents and opium, in diarrhœas, especially those of teething children. Dose f℥ss–j (15.0–30.0). *Troches of chalk* (*trochisci cretæ*); each contains gr. jv (0.25) of prepared chalk.

Other preparations of calcium have been previously considered.

GROUP II.—TOPICAL MEDICINES.

Class I.—Antiseptics.

What are antiseptics?

Antiseptics are medicines which prevent fermentation and decomposition by destroying, or preventing the development of, the germs on which these processes depend. They are not always *germicides* (remedies which kill the germs of disease), for some of them hinder the growth and prevent the development of fresh germs, without destroying those already present; nor are they always *deodorants* (remedies which destroy disagreeable odors), for the microbes of disease may be destroyed, and foul chemical emanations continue, or the latter may exist without the presence of the former.

Name the chief antiseptics.

Antiseptics may be divided, according to their chemical composition, into *the inorganic* or *elementary*, and *the organic antiseptics* (or those belonging to the group of carbon compounds, including antiseptic oils and their camphors). To the first group belong hydrogen dioxide, potassium permanganate, chlorine water, chlorinated lime, Labarraque's solution, mercuric chloride, bromine, iodine, mercuric iodide, iodoform, iodol, sulphurous acid, sulphites, sulphides, boric acid, borates, and many of the mineral salts previously mentioned, as iron sulphate, lead nitrate, etc. In the second division are included carbolic acid and the carbonates, creosote, benzoic acid and the benzoates, naphthalin, naphtol, formaldehyd, the antipyretics (*q. v.*), the antiseptic oils (*v.* "*Carminatives*"), and thymol.

AQUA HYDROGENII DIOXIDI—SOLUTION OF HYDROGEN DIOXIDE.

What is solution of hydrogen dioxide?

It is a slightly acid, aqueous solution of hydroge
known as *hydrogen peroxide*), contain
about 3 per cent., *by* weight, of th

to about 10 volumes of available oxygen. It occurs as a colorless liquid, without odor, but having a slightly acidulous taste.

It parts readily with its oxygen, and thus acts as an *oxidizing disinfectant.*

It is of course greatly inferior to mercuric chloride as a disinfectant, antiseptic, and germicide, but has the advantage of being non-poisonous. When brought in contact with pus, as on a suppurating surface, gas is evolved more or less abundantly, depending on the amount of pus present; a slight, superficial coagulation forms on the surface and the pus corpuscles are disintegrated.

It has been *used* as an *antiseptic injection* into *abscess cavities* after the evacuation of their contents, and into *sinuses;* and also as a local application to *superficial wounds* and *ulcers*, whether of common or specific origin. It is also used as an injection in *gonorrhœa.* In *scarlatinal* or *diphtheritic sore throat*, and in *tonsillitis*, it is often used as a gargle or spray.

It is a good *buccal disinfectant* and may advantageously be used for this purpose *in typhoid* and *other low fevers*, or in any case where the secretions tend to collect in the mouth and become offensive.

On account of the oxygen evolved it is an active *bleaching agent*, and is used in solutions of 10 to 15 per cent. strength to bleach black hair.

POTASSII PERMANGANAS—POTASSIUM PERMANGANATE.

What is potassium permanganate?

Potassium permanganate has been considered with the preparations of manganese (*v.* "*Mineral Tonics*"). Its disinfectant powers are great, but it is decomposed immediately on contact with organic matter, and hence is chiefly used in solution as a gargle in scarlatina and diphtheria, as a lotion to cancerous and other ulcers, to correct fœtor in otorrhœa, etc., and as an injection in leucorrhœa and in gonorrhœa. It is given internally as an emmenagogue (*q. v.*).

AQUA CHLORI—CHLORINE WATER.

What is chlorine-water?

It is an aqueous solution, containing at least 0.4 per cent. of *chlorine.* It is a powerful irritant and antiseptic. Albumin is the best *antidote.*

It is chiefly used, diluted, as a gargle in *diphtheria*, and as a wash for foul *ulcers* and *wounds.*

CALX CHLORATA—CHLORINATED LIME.

What is chlorinated lime?

It is composed of calcium hypochlorite and chloride, and when exposed to the air is decomposed, yielding about 35 per cent. of chlorine. It is an antiseptic, and is used to disinfect the air of sick rooms, urine, sputum and fecal discharges and privies.

LIQUOR SODÆ CHLORATÆ—SOLUTION OF CHLORINATED SODA.

What is this substance?

Solution of chlorinated soda, or *Labarraque's solution*, contains at least 2.6 per cent., by weight, of available chlorine, and may be used for the same purposes as the foregoing preparations.

HYDRARGYRI CHLORIDUM CORROSIVUM—MERCURIC CHLORIDE.

What is mercuric chloride?

This preparation has been considered with the mercurial salts (*v.* "*Alteratives*"). It is a valuable germicide, and is used in aqueous solutions of various strengths (1–2000 to 1–16,000) in all manner of surgical operations and affections where an antiseptic is required and can be employed. As several cases of poisoning have been reported, especially from its use in gynæcological and obstetrical practice, it should be employed with some caution.

BROMUM—BROMINE. IODUM—IODINE.

Are these substances antiseptic?

Bromine (*v.* "*Escharotics*") and *iodine* are powerful antiseptics, but are rarely used for this purpose, as their management requires great care and experience.

HYDRARGYRI IODIDUM RUBRUM [illegible]IC IODID

Is mercuric iodide antiseptic?

Mercuric iodide is a powerful germi[illegible] as a substitute for corrosive sublimat[illegible] *seded the latter.*

IODOFORMUM—IODOFORM.

What is iodoform?

Iodoform is formyl teriodide, and occurs in minute yellowish crystals, with a disagreeable odor. It is insoluble in water, but freely soluble in ether and alcohol.

What are its effects and uses?

Locally, it is an antiseptic and local anæsthetic. It prevents the multiplication of germs, but will not destroy them if present before its use. It seems to be more readily absorbed by abraded than by mucous surfaces. *Internally*, it is tonic and alterative. *Moderate doses* stimulate the cardio-inhibitory centre, slowing and strengthening the cardiac beat and elevating the blood pressure, while *large doses* depress this centre, and finally paralyze the cardiac muscle. The *temperature* is generally reduced. It increases the salivary, biliary and intestinal secretions, and is eliminated chiefly by the kidneys (as sodium iodate), but to a slight extent by the lungs also. When excessive amounts are absorbed, either from internal or external sources, glomerulo-nephritis and fatty degenerations of various organs occur. Cases of poisoning may be divided into six classes, the danger increasing progressively from the first to the last: 1. High fever; 2. Fever, gastro-entero irritation, rapid pulse; 3. Very rapid, compressible pulse, no fever; 4. Very rapid pulse and high fever; 5. Great depression and collapse, rapidly fatal; 6. Symptoms like meningitis. Should poisoning occur, remove every particle of the dressing if it has been used locally, give opium and stimulants and treat symptoms. Iodoform has been *used* internally as a *cardiac tonic* in valvular disease with insufficient hypertrophy, and as an *alterative* in syphilitic rheumatism, neuralgiæ and the early stages of phthisis. In *diabetes mellitus* it has been advantageously given. *Externally*, it is employed as an anæsthetic and antiseptic dressing to irritable ulcers of all kinds, burns and wounds. In *ethereal solution* it has been injected into the cavities of strumous abscesses, after the evacuation of their contents, to destroy the giant cells of tubercle and promote healthy granulation. In *sup-*
sitories it is used in inflammation and ulceration of the vagina,
us and rectum. *Bougies* containing iodoform are sometimes
septic affections of the uterus and in gonorrhœa.
gr. ¼-v (0.01-0.3), in pill or capsule.

The *ointment* (*unguentum iodoformi*) contains 10 per cent. of iodoform.

IODOL.

What is iodol?

Iodol (not (official) is made by the action of iodine on pyrol, and contains 88.9 per cent. of the former. It is recommended as a substitute for iodoform, being tasteless, odorless, and, as it is more slowly absorbed, less likely to produce dangerous effects. It is especially recommended in nasal, pharyngeal and laryngeal cases, particularly in tubercular laryngitis, and may be used either in powder (by insufflation) or in solution with alcohol and glycerin. It has also been used internally in those cases to which iodoform is applicable. Dose gr. ss–iij (0.03–0.19), in pill or capsule.

ACIDUM SULPHUROSUM—SULPHUROUS ACID.

What is sulphurous acid?

Sulphurous acid is an aqueous solution of about 6.4 per cent., by weight, of sulphurous acid gas.

What are its effects and uses?

It is a powerful deoxydizing agent, and deodorant. When sufficiently concentrated the gas is probably a germicide. When inhaled it is irritant, and, if in sufficient amount, causes inflammation and even acts as a caustic from the formation of sulphuric acid. It is eliminated by the urine and feces as sulphates. It is *used internally* (diluted) in *yeast-vomiting* to prevent the formation of *sarcina ventriculi* in *flatulency* depending on fermentation of the food, and *locally* as a wash in various parasitic skin diseases. In the form of burning sulphur it is employed to disinfect rooms. Dose ♏v–f℥j (0.3–4.0), freely diluted.

THE SULPHITES AND SULPHIDES.*

What are the effects and uses of these salts?

The *effects* of the *sulphites* depend upon the sulphurous acid which they contain, and which is readily evolved on the addition of almost any acid. On exposure to the air they are converted into sulphates. Taken internally they are decomposed by the acid of the gastric juice, evolve sulphurous acid, are finally converted into sulphates, and thus absorbed and eliminated. They are *used* to fulfill the indications for sulphurous acid. The dose of *sodium sulphite* (*sodii sulphis*) is gr. v–xxx (0.3–2.0) t. i. d.; *sodium bisulphite* (*sodii bisulphis*) gr. v–xx (0.3–1.3); *sodium hyposulphite* (*sodii hyposulphis*) gr. v–xx (0.3–1.3).

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* See footnote, p. 71.

The *sulphides* are said to possess the power of arresting the formation of pus in threatened boils and abscesses, and are used internally for this purpose.

Calx sulphurata (*sulphurated lime*) consists of a mixture containing at least 60 per cent. of calcium monosulphide together with unchanged calcium sulphate and carbon, in varying proportions, and is given in doses of $\frac{1}{10}$–$\frac{1}{2}$ (0.006–0.03), repeated every $\frac{1}{2}$–1 hour. *Sulphurated potassa* will be found among the sulphur preparations (*v.* "*Cathartics*").

ACIDUM BORICUM—BORIC ACID.
SODII BORAS—BORAX.

What are the effects and uses of boric acid and its salts?

Locally boric acid is antiseptic and deodorant. *Internally* they are somewhat diuretic, and retard the decomposition of the urine. Two fatal cases from the injection of large quantities into the pleural sac, and the cavity of a large lumbar abscess, have been reported, death being due to collapse and cardiac failure.

Boric acid is used as an antiseptic in powder or solution in many external inflammations and wounds, and in inflammations and aphthous or diphtheritic ulcerations of the mouth and fauces, the acid or its salts are of undoubted value.

In solution it has also been used to wash out *abscess cavities* and as an injection in *gonorrhœa.* As a *disinfectant* and *deodorant* in ophthalmic and aural practice it is very useful. Boric acid is recommended internally in *cystitis* depending on ammoniacal decomposition of the urine, and as an injection into the bladder in the cystitis of spinal diseases. Dose of the *acid* gr. v–x (0.3–0.6), t. i. d.; of the salt gr. xx–ʒj (1.2–4.0).

Glyceritum boroglycerini (*glycerite of boroglycerin—glycerite of glyceryl borate—solution of boroglycerite*) is made by dissolving 31 per cent. of boric acid in glycerin by means of heat, and is used as an external application for the disinfection of unhealthy ulcers or suppurating surfaces generally.

It is a useful application to burns, and has been applied with advantage to inflamed mucous membranes, as the pharynx, nasal passages, or conjunctiva.

ACIDUM CARBOLICUM—CARBOLIC ACID.

What is carbolic acid?

Carbolic acid, *phenol* or *phenic acid* is an oily liquid, or crystalline solid, which readily deliquesces, and is derived from coal-tar by fractional distillation.

What are the tests for carbolic acid?

The addition of *ferric sulphate* produces a lilac color; *bromine-water* causes a yellowish precipitate; it coagulates albumen, and precipitates nitro-cellulose from collodion.

What are its physiological actions?

Carbolic acid is a local anæsthetic and caustic (producing a white eschar) when used in concentrated solutions; it is antiseptic and germicide. *Internally*, it is a powerful gastro-intestinal irritant when taken undiluted. In diluted solutions it is an astringent.

It first stimulates and then exhausts the vagi (causing slowing, followed by acceleration of the heart's action, which is finally paralyzed), reduces the arterial pressure by paralyzing the vasomotor centres of the cord, increases and then depresses the respiratory movements, from its influence on the vagi and respiratory centre, and in large doses lowers the temperature slightly. In poisonous doses it causes vertigo, tremors, contracted pupils, stupor, coma, impaired motion, sensation and reflex action, and in the lower animals convulsions of spinal origin. It is eliminated chiefly by the kidneys and lungs, imparting a smoky color to the urine when the dose is excessive.

This is a sign of impending danger.

If poisoning occur from external applications, remove the *dressings immediately*; if the acid has been swallowed, give a saturated solution of calcium carbonate. In either case administer atropine hypodermically, to counteract its respiratory and cardiac effects, and diluents freely, to aid its elimination.

What are its medicinal uses?

Carbolic acid was used externally as an antiseptic dressing and lotion in the various surgical affections and operations to which the mercuric chloride is applicable. It has also been used as a local anæsthetic previous to minor surgical operations, as the opening of small abscesses and felons, and in dilute solution to allay pruritus. It has been injected into the cavities of chronic abscesses and of the tunica vaginalis, to cause obliteration of their sacs after the withdrawal of the contained fluid.

Internally carbolic acid has been much used as a *gastric sedative* to check *vomiting*; as an *astringent* in *diarrhœa*; as an *antifermentative*; as a *germicide* in *sarcina ventriculi*; and as an *antizymotic* in *typhoid fever*, *smallpox*, *scarlatina*, and *diphtheria*. It is also used by inhalation in *nasal catarrh*, *hay fever*, *bronchorrhœa*, *pertussis*, and *pulmonary gangrene.*

What are its preparations and doses?

ACIDUM CARBOLICUM (*carbolic acid*), dose gr. j–ij (0.06–0.13).

GLYCERITUM ACIDI CARBOLICI (*glycerite of carbolic acid*) contains 20 per cent. of the acid dissolved in glycerin. Dose ♏ ij–v (0.12–0.3).

ACIDUM CARBOLICUM CRUDUM (*crude carbolic acid*) may be used externally as a disinfectant. The *ointment* (*unguentum acidi carbolici*) contains 5 per cent. of the acid.

THE SULPHOCARBOLATES.

What are the sulphocarbolates?

Sodii sulphocarbolas (*sodium sulphocarbolate* or *sodium paraphenol sulphonate*)—the only one which is official - is used *internally* to fulfill the indications of carbolic acid, and as an antifermentative in flatulency from fermentation of the food. It is also used *locally* as a sedative application to inflamed mucous membranes. Dose gr. x–xv (0.6–1.0) t. i. d.

CREOSOTUM—CREOSOTE.

What is creosote?

Creosote is a substance closely resembling carbolic acid, derived from wood-tar by dry distillation. It may be distinguished from carbolic acid by not coagulating collodion. It resembles carbolic acid in its effects and uses, and a solution of the latter is generally sold for it in the shops. The dose of pure creosote is ♏j–iij (0.06–0.18).

Aqua creosoti (*creosote water*) is a 1 per cent. solution of creosote.

ACIDUM BENZOICUM—BENZOIC ACID.

What is benzoic acid?

Benzoic acid is obtained from benzoin by sublimation, and is an ingredient of many of the substances (*the balsams*) previously considered. *Locally* it is an irritant, antiseptic and germicide. *Internally* it increases the secretions generally, and is eliminated chiefly by the urine increasing the acidity of that fluid, hence its value in the phosphatic diathesis. It has been used *locally* as an antiseptic in the treatment of wounds and ulcers, but is not much employed for these purposes at present. It is also used as a stimulant and antiseptic application in the treatment of *chapped hands*, *fissured nipples*, etc., but for this purpose the preparations of benzoin are preferred. Benzoic acid or its salts are of great value in the treatment of *cystitis* from alkaline urine, *phosphatic deposits* in the urine, etc., for by acidulating the urine it renders the phosphates more soluble. They are also used internally as *antiseptics* in *diphtheria*, *erysipelas*, etc. Benzoic acid is added to unguents, to prevent rancidity. The dose is gr. v–xx (0.3–1.2); but for internal administration the salts are generally preferred.

Sodii benzoas (*sodium benzoate*) has been used as an *antipyretic* in *rheumatism*, and as an *antiseptic* in *pertussis*, *diphtheria*, and *the exanthemata*. Dose ʒj–ij (4.0–8.0).

Ammonii benzoas (*ammonium benzoate*) is the best remedy for *incontinence* due to vesical irritation from alkaline decomposition of the urine. Dose gr. v–xx (0.3–1.2).

NAPHTALINUM—NAPHTALIN.

What is naphtalin?

Naphtalin, also called *naphthalene* or *naphthalin*, is a hydrocarbon obtained from coal-tar, occurring in colorless, transparent plates, and having a strong, peculiar odor, and a burning, somewhat aromatic taste. It is soluble in alcohol, but insoluble in water.

Naphtalin is *antiseptic* and *antiparasitic.* *Locally* it is mildly stimulant. When given internally in large doses or for a length of time it causes gastric irritation. Very little is absorbed when taken internally, the greater part being eliminated by the fæces and acting as an *intestinal antiseptic.* Some little, however, passes into the system and is eliminated by the kidneys and by the lungs. It is said that its continued administration to animals has resulted in cataract.

It is chiefly *used* as an *intestinal antiseptic* in typhoid fever, diarrhœas, and dysentery. It is also used as an *anthelmintic*, given internally for the removal of lumbrici, or used as an injection (gr. x–xx (0.6–1.2)) in sweet oil (f℥iij (90.0)) to destroy the oxyuris. It has also been given in *pyelitis*, *cystitis*, etc., for its antiseptic effect on the urine, and has been employed in the treatment of *bronchorrhœa* and *fœtid bronchitis.* As a *local antiseptic* it is not much used. It has been used as a dressing for *wounds*, *ulcers*, and *chronic abscesses.* Dose gr. ij–x (0.12–0.64), administered in capsules.

NAPHTOL.

What is naphtol?

Naphtol, also called *isonaphthol* or *betanaphthol*, is a hydrocarbon prepared from naphthalene. It occurs as a white or yellowish-white powder, or in crystalline plates, with a faint phenol-like odor and a pungent taste. It is freely soluble in alcohol, but only slightly so in water.

In its action it resembles closely naphthalene. In animals large doses cause death by respiratory paralysis. No toxic symptoms have been reported in the human subject from its use.

Its *uses* are similar to those of naphtalin. It is a good *intestinal antiseptic*, preventing fermentation and consequent flatulence, and is used in gastric or intestinal fermentation, in dilated stomach, and in diarrhœas and dysentery. Dose gr. ij–v (0.12–0.32) although much larger doses have been given without deleterious effect. It is usually administered in capsules, which may be keratin-coated when used as an intestinal antiseptic. It is often advantageously combined with bismuth subnitrate and sodium bicarbonate.

FORMALDEHYD.

What is this substance?

Formaldehyd, or *formic aldehyd* (not official), is an aqueous solution containing 40 per cent. of *formalin* or *formal*, obtained by oxidation of methyl alcohol. It forms a colorless solution having a pungent odor and taste. It has been much used as a deodorant and disinfectant and is said to be poisonous in a very moderate degree. Concentrated solutions applied to the skin are said (R. H. Cunningham) to cause a peculiar necrosis, unaccompanied by signs of inflammation. The gas is liberated by heating the solution, and it is said that an atmosphere containing 2.5 per cent. of the gas is speedily fatal to all micro-organisms.

It *has been used* to *disinfect* the surgeon's hands and instruments, in the preparation of aseptic catgut ligatures, and in dilute solutions (1 : 2000) in the treatment of *gonorrhœal affections of the female*. *In the male* it has sometimes effected a cure in *acute gonorrhœa*, more frequently when the disease was situated in the deeper parts of the urethra. Occasionally the irritation caused by its use was so great that the irrigation had to be discontinued. It has also been used in solutions of the same strength in *acute conjunctivitis*. Recently it has been recommended as a spray (1 per cent. solution, in the treatment of *pertussis*, and, used in the same manner, is strongly recommended in the treatment of *hay asthma*.

THE ANTIPYRETICS AND ANTISEPTIC OILS.

Are these substances used as antiseptics?

The *antipyretics* (*q. v.*) have been sufficiently considered.

The antiseptic properties of the *volatile oils* classed with the "*Carminatives*" (*q. v.*) have been alluded to under that head. Those of importance not hitherto mentioned are:

THYMOL.

What is thymol?

Thymol (*cymylic phenol*) is a crystalline substance found in the oil *of thyme (oleum thymi)* (*q. v.*). Locally it is a powerful antiseptic and local anæsthetic. Given internally it lowers febrile temperature to some extent, and causes diaphoresis. In excessive amount it causes tinnitus aurium, deafness, diarrhœa, and sometimes delirium and collapse. It is used as an *antiseptic gargle* and *mouth-wash* in aphthous and diphtheritic ulcers of the mouth and fauces, and internally as a *gastric sedative* to allay vomiting. As an *anti-fermentative*, in flatulency from fermentation of the food and in intestinal indigestion, it is very useful. Dose gr. ss–ij (0.03–0.13). As much as gr. xx–xxx (1.2–2.0) have been given in 24 hours. It is administered in solution in glycerin, alcohol, and water.

Class II.—Irritants.

What are irritants?

Irritants are medicines which are used locally to produce counter-irritation or inflammation of the parts to which they are applied. They are divided, according to the violence of their action, into Rubefacients, Vesicants, Suppurants, and Escharotics or Caustics.

ORDER I.—RUBEFACIENTS.

What are rubefacients?

Rubefacients are medicines which are employed to produce a powerful but temporary irritation and congestion of the surface. They are useful in arousing the system in shock; in stimulating the circulation of a part in case of frost-bite, or to aid in bringing on reaction in the cold stage of a congestive chill; in all cases of congestion and in the formative stages of inflammations. The application of rubefacients for the relief of neuralgic and muscular pains is often followed by improvement which may even be permanent.

Mention the principal rubefacients.

Mustard; capsicum; oil of turpentine; ammonia; Burgundy pitch, and Canada pitch.

SINAPIS ALBA—WHITE MUSTARD.

SINAPIS NIGRA—BLACK MUSTARD.

What is mustard?

Mustard is the seed of Brassica alba, or white mustard, and B. nigra, or black mustard (*Nat. Ord.* Cruciferæ).

What chemical principles do they contain?

Mustard seed contains a *fixed oil.* Black mustard seed yield on distillation a volatile oil (allyl sulphocyanide) which does not preëxist in the seed, but is formed by the action of water on *sinigrin* or *potassium myronate.* The white seed yield an *acrid fixed principle* which is formed by the action of water on *sinalbin.* These changes are probably due to the presence of *myrosin*, an albuminous ferment.

What are the effects and uses of mustard?

Locally, it is an irritant rapidly causing redness and a sensation of heat; if the application is long continued, inflammation and even gangrene may result. Internally it is a stomachic in small doses, an emetic in larger amounts, and a severe gastro-intestinal irritant if an excessive quantity be taken.

Mustard is *used* as a *rubefacient* in the form of a mustard plaster (made of the powdered seed known as mustard flour), whenever a mild counter-irritant effect is desired. The mustard should not be allowed to come in contact with the skin, but should be separated from it by a piece of gauze or a fold of muslin or newspaper. When a prolonged but gentle effect is desirable, the mustard may be added to a flaxseed poultice or diluted with flour. *Internally*, mustard-flour is used as an *emetic*, and is especially valuable when torpor of the stomach is present.

What are the preparations of mustard, and their doses?

The dose of powdered mustard as an emetic is ʒj–iv (4.0–16.0).

The official preparations are *mustard-papers* (*charta sinapis*), a convenient form for external use. Each square inch of paper contains about gr. vj of black mustard deprived of its oil. They should be dipped in warm water before applying. The *volatile oil* (*oleum sinapis volatile*) is very irritant, and is used in preparing the *compound liniment* (*linimentum sinapis compositum*).

CAPSICUM. OIL OF TURPENTINE. AMMONIA.

Are these substances used as rubefacients?

The uses of these substances as rubefacients will be found in detail under the respective drugs.

Linimentum ammoniæ (*liniment of ammonia*) contains 3.5 per cent. of ammonia water in cotton-seed oil and alcohol.

PIX BURGUNDICA—BURGUNDY PITCH.

What is Burgundy pitch?

Burgundy pitch is the prepared *resinous exudation* from Abies excelsa, or Norway spruce (*Nat. Ord.* Coniferæ). It contains a *resin* and a *volatile oil*, and is a mild rubefacient, used in the form of plaster in *subacute* and *chronic bronchitis*, to the back in lumbago, and to the joints in *chronic rheumatism*.

Pitch plaster with cantharides (*emplastrum picis cum cantharidê*) is more stimulating than the *plaster* (*emplastrum picis Burgundicæ*). *Iron* and *opium plasters* contain Burgundy pitch.

ORDER II.—VESICANTS.

What are vesicants?

Vesicants are remedies which, when applied to the skin, cause sufficient inflammation to produce an effusion of serum under the cuticle, or, in other words, to raise a blister. They are also called *epispastics*, or *blisters*. They are used in inflammations of the serous membranes, especially when accompanied by an outpouring of serum; to deplete the vessels in inflammations of the brain and its membranes; in chronic joint affections; in neuritis, and for the relief of various neuralgic pains, and are sometimes used in inflammations of the parenchymatous viscera. They are contraindicated in the very young or very old, where there is great depression of the vital powers, or where there is very high arterial tension.

Name the principal vesicants.

Spanish fly, potato fly, and stronger water of ammonia.

CANTHARIS—CANTHARIDES.

What is cantharides?

Cantharis vesicatoria or Spanish fly (*Class*, Insecta; *Order*, Coleoptera) is an insect found in the temperate parts of Europe, but especially in Spain and Italy. When dried they contain a *volatile oil* and a neutral crystalline principle, *cantharidin*, the vesicating principle.

What are its effects and uses?

Locally, cantharides is an intense irritant to any surface with which it comes in contact; thus, applied to the skin it causes inflammation of sufficient intensity to result in a serous effusion under the cuticle, and if the application be too long continued, gangrene may result. Constitutional effect may be caused from the local application of cantharides. *Internally*, *in small doses*, it is diuretic; in *larger amounts* it is an irritant, causing pain on urination, priapism, *strangury*, and even bloody urine. Sexual desire does not usually occur. *In excessive doses* it is a gastro-ent vomiting and purging, and even death, often preceded by dilated pupils, delirium, convulsions, and collapse. On *post-mortem examination* severe inflammation of the alimentary canal, kidneys, and bladder is found. The *treatment* consists in removing the application, or evacuating the contents of the stomach; the free use of diluents; opium (especially by the rectum); and avoiding all oily substances, as these aid the absorption of the poison.

What are its medicinal uses?

The internal uses of cantharides have previously been noticed (*v.* "*Emmenagogues*" and "*Diuretics*"). Externally it is used as a blistering agent, almost to the exclusion of other remedies. It must be remembered that poisoning may result from its local application.

What are its preparations and their doses?

The *cerate* (*ceratum cantharidis*) is used locally as a blistering agent, and is often known as *blistering cerate. Cantharidal collodion* (*collodium cantharidatum*) is applied with a brush, and is a convenient way of applying a blister to an irregular surface. The *tincture* (*tinctura cantharidis*) is used internally; dose gtt. v–x (0.3–0.6).

CANTHARIS VITTATA—POTATO FLY.

What is this substance?

The potato fly (not official) is an indigenous insect which contains *cantharidin*, and may be used as a substitute for the Spanish fly.

AQUA AMMONIÆ FORTIOR—STRONGER WATER OF AMMONIA.

Is this ever used as a blistering agent?

Stronger ammonia-water is a rapid but painful vesicant.

It forms the basis of *Granville's vesicating lotion* and of *Gondret's vesicating ointment.* It is but little used for this purpose.

ORDER III.—SUPPURANTS.

What are suppurants?

Suppurants are remedies which cause such powerful irritation of *the surface to* which they are applied as to produce a crop of pustules. They are seldom employed at present except as an application to the throat and chest in *chronic laryngeal* or *bronchial affections*, or to the surface of a joint when *chronic inflammation* is present. The only medicines belonging to this order are *Croton oil* and *antimonial ointment*. These remedies have been previously described. Antimonial ointment is the more painful and its effects are more lasting. It is no longer official.

ORDER IV.—ESCHAROTICS.

What are escharotics?

Escharotics are medicines which are applied locally to destroy the structure and vitality of the tissues. The dead tissue excites inflammation, and is thrown off by ulcerative action. It is called the *slough*, or *eschar*. Escharotics are *used* to destroy *morbid growths*, as lupus, epithelium, condylomata, warts, fungous granulations, etc.; to *destroy the virus* of malignant pustule, hospital gangrene, the bites of rabid animals or poisonous reptiles, the virus of chancre, etc.; to substitute a healthy for diseased action, and to stimulate indolent ulcers, sinuses, etc.

Mention the principal medicines used for these purposes?

Caustic potash; caustic soda; arsenious acid; bromine; zinc chloride; acid nitrate of mercury; corrosive sublimate; potassium bichromate; the mineral acids; silver nitrate; copper sulphate; and burnt alum.

POTASSA.

What is potassa?

Potassa is formed by the rapid evaporation of the solution of potassa, and is moulded into thin cylindrical sticks.

What are its effects and uses?

It is an exceedingly powerful caustic, destroying the surrounding tissues and penetrating to some depth below the surface. When it is used, it is well to protect the surrounding tissues from its action by adhesive plaster with a hole cut in its centre, through which the caustic is applied. It is used when a powerful effect is desired.

Potassa cum Calce (*potassa with lime*) consists of equal parts of *potassa and quicklime*, and is a powerful caustic. It is sometimes called *Vienna paste*.

SODA.

What is soda?

Caustic soda is made by the rapid evaporation of the solution of soda, and is a very powerful caustic, resembling potassa in its effects and uses. *London paste* is made by rubbing up equal parts of soda and lime.

ACIDUM ARSENOSUM—ARSENOUS ACID.

Is arsenous acid used as a caustic?

The uses of this substance as a caustic will be found under the article "Arsenic" (*v.* "*Alteratives*").

BROMUM—BROMINE.

What is bromine?

Bromine is a halogen element, and is a very powerful caustic. It is a volatile liquid, and has very great affinity for hydrogen. *Locally* it is a powerful deodorant and disinfectant, and a severe and deeply penetrating caustic. When *inhaled*, it is an intense irritant, producing laryngitis, bronchitis and even pneumonia. *Internally*, if not sufficiently diluted, it is a corrosive poison. It is *used* as a *caustic* in *hospital gangrene* after the removal of the slough. As it is heavier than water it may be poured into a wide-mouthed bottle half filled with water, which will prevent it from giving off irritating fumes. From this it may be sucked up with a syringe and injected into the wound which it is desired to cauterize. The fumes are sometimes cautiously inhaled for the cure of *acute coryza*, *chronic nasal catarrh*, *ozœna*, *hay asthma*, etc. For purposes of inhalation a solution of ʒss (2.0) in ℥jv (120.0) of alcohol may be used.

ZINCI CHLORIDUM—ZINC CHLORIDE.

LIQUOR HYDRARGYRI NITRATIS—SOLUTION OF MERCURIC NITRATE.

HYDRARGYRI CHLORIDUM CORROSIVUM—MERCURIC CHLORIDE.

Are these medicines escharotics?

The uses of these substances as caustics will be found under Zinc (*v.* "*Astringents*") and Mercury (*v.* "*Alteratives*").

POTASSII BICHROMAS—POTASSIUM BICHROMATE.

What is potassium bichromate?

It is an irritant *internally*, and in overdoses a corrosive poison. *Externally* it is a *caustic*, used to destroy syphilitic condylomata, warts, etc. *Internally* it is used as an *alterative* in doses of gr. $\frac{1}{5}$ (0.013) t. i. d.

THE MINERAL ACIDS.

Are the mineral acids used as caustics?

The mineral acids are powerful caustics, and are often employed to remove warts, or other excrescences, to cauterize chancres, indolent sinuses and ulcers. Nitric acid is preferred as an escharotic.

SILVER NITRATE, COPPER SULPHATE, and ALUM have all been previously spoken of as caustics under their appropriate heads.

Class III.—Demulcents.

What are demulcents?

Demulcents are bland remedies which, when applied to inflamed or irritated surfaces, exert a soothing influence upon them and are employed internally for this purpose. They are *used* in acute inflammations of the alimentary canal; in pharyngeal, laryngeal and bronchial irritation; in renal, cystic, and urinary affections generally; and to suspend medicinal substances which are insoluble in water. They are also used as light articles of diet.

Describe the demulcents.

AQUA (*water*) is used in medicine in its purest attainable state, *i. e.*, rain or melted snow. For pharmaceutical purposes it should only be used in the form of *distilled water* (*aqua destillata*). A certain amount of water is necessary for the proper performance of the functions of the body. It is an *active diuretic*, increasing not only the watery, but also the solid ingredients of the urine. It is *eliminated* by the kidneys, skin, lungs and bowels. It is *used* as a *diuretic* in acute renal diseases, and is also often serviceable in chronic Bright's disease. To dilute a highly concentrated urine in *ardor urinæ*, especially when there is a tendency to the formation of gravel or calculi, it is invaluable.

It is useful in fevers, as it aids the elimination of the waste products. *Externally*, it is used in the form of baths, either hot or cold, not only for purposes of cleanliness, but also as a therapeutic agent. Impregnated with carbonic acid gas under pressure, it makes an agreeable drink known as *soda-water*, which is often useful in allaying nausea and vomiting.

ACACIA, or *gum arabic*, is a *gummy exudation* from Acacia Senegal (*Nat. Ord.* Leguminosæ), a tree of Africa. It contains *arabic acid*, and is much *used* in solution as a demulcent in various forms of *sore throat*. It is also used in making emulsions and pills.

Its preparations are: a *mucilage* (*mucilago acaciæ*) and a *syrup* (*syrupus acaciæ*). *Emulsion of almonds* (*emulsum amygdalæ*) is an agreeable form for administration.

TRAGACANTHA (*tragacanth*) is a *gummy exudation* from Astragalus gummifer and other species of Astragalus (*Nat. Ord.* Leguminosæ), and contains *arabin* and *tragacanthin.* It is only *used* internally as an agent to suspend heavy powders or to give consistence to lozenges. A *mucilage* (*mucilago tragacanthæ*) is official.

ULMUS (*elm*) is the *inner bark* of the Ulmus fulva, or slippery elm (*Nat. Ord.* Urticaceæ), and contains a large amount of mucilaginous matter, and though more often used *externally* as an emollient poultice, is sometimes employed as a *demulcent* in inflammations of the bowels, and in laryngitis. A *mucilage* (*mucilago ulmi*) is official.

ALTHÆA, the root of A. officinalis, or marsh-mallow (*Nat. Ord.* Malvaceæ), is a pleasant demulcent. A *syrup* (*syrupus althææ*) is official.

LINUM (*flaxseed*) is the *seed* of Linum usitatissimum, or flax (*Nat. Ord.* Lineæ), and contains *fixed oil*, *mucilaginous matters*, *vegetable albumen*, etc. The *oil* (*oleum lini*) is a laxative, but is chiefly used externally in emollient liniments. The seed may be used internally as an infusion, flavored with lemon and sugar (*flaxseed tea*), in bronchial catarrhs, enteric inflammations, dysentery, and renal, vesical, or urethral irritations. The ground seed are much used to make emollient poultices.

SASSAFRAS MEDULLA (*sassafras pith*) is the pith of the stems of S. variifolium (*Nat. Ord.* Laurineæ). The *mucilage* (*mucilago sassafras medullæ*) may be *used* internally as a demulcent, but is chiefly employed locally in inflammations of the eye.

GLYCYRRHIZA, commonly called *liquorice-root*, is the root of G. glabra (*Nat. Ord.* Leguminosæ). It contains a *glucoside* (*glycyrrhizin*), *asparagin*, *resin*, etc. It is chiefly used as a demulcent in catarrhal affections of the respiratory organs and to disguise the taste of quinine, of the ammonium salts, and of other disagreeable medicines; occasionally, also, in kidney and bowel complaints. The preparations are an *extract* (*extractum glycyrrhizæ*), often called *liquorice*; *refined extract* (*extractum glycyrrhizæ purum*); *fluid extract* (*extractum glycyrrhizæ fluidum*), used as an addendum to cough medicines; *ammoniated glycyrrhizin* (*glycyrrhizinum ammoniatum*) dose gr. v–x (0.3–0.6); *compound glycyrrhiza mixture*, *brown mixture* (*mistura glycyrrhizæ composita*) contains the refined extract, mucilage of acacia, syrup, paregoric (12 per cent.), antimonial wine (6 per cent.), sweet spirits of nitre and water; dose f℥ss (15.0). *Compound liquorice powders* (containing sulphur and senna, —used as a laxative), have been previously mentioned.

CETRARIA.—Cetraria islandica, or Iceland moss (*Nat. Ord.* Lichenes), is a lichen growing in the northern portions of both continents. It contains *lichenin* and a bitter principle, *cetrarin*, and is used as a demulcent. A *decoction* (*decoctrum cetrariæ*) is official.

CHONDRUS.—Chondrus crispus, Irish Moss, or Carrageen (*Nat. Ord.* Algæ), is a marine plant found on the coast of Ireland and New England. It contains *carrageenin*, etc., and is used as a nutritive (in the form of a blance-mange), as a demulcent, and locally as an emollient poultice.

AMYLUM (*starch*).—This is the *fecula* of the *seed* of Zea mays (*Nat. Ord.* Graminaceæ). With iodine its solution forms a rich blue iodide. It is converted into glucose in the alimentary canal, and thus absorbed. It is used as an article of diet and locally as a dusting powder. Its solution is employed as a vehicle for laudanum enemata.

Glyceritum amyli (*glycerite of starch* or *plasmine*) is used as a vehicle for astringent applications to the eye, and as an unguent in scarlatina aud smallpox.

LYCOPODIUM, the *sporules* of L. clavatum, or club-moss and other species of lycopodium (*Nat. Ord.* Lycopodiaceæ), is used as a dusting powder for intertrigo, and is very useful in children with excoriated nates.

ICHTHYOCOLLA (*isinglass*) is prepared from the swimming bladder of Acipenser Huso (the sturgeon) and other species. (*Class*, Pisces; *Ord.* Sturiones). It is the purest form of gelatine, and is chiefly used locally as a *plaster* (*emplastrum ichthyocollæ—court-plaster*). Gelatine is also used as an article of diet, and in the form of *capsules for administering* other medicines.

Class IV.—Emollients.

What are emollients?

Emollients are bland, fatty substances used externally to soften the skin and render it more pliable or to serve as a vehicle for other medicaments.

Describe the emollients.

ADEPS (*lard*), the prepared internal fat of the abdomen of Sus Scrofa (the hog), consists of olein and stearine, and is used in the preparation of unguents. *Ointment* (*unguentum*) consists of lard (80 per cent.) melted with yellow wax. *Cerate* (*ceratum*) contains 70 per cent. of lard and 30 per cent. of white wax. *Adeps* (*benzoinated lard*) contains 2 per cent. of benzoin to prevent rancidity.

ADEPS LANÆ HYDROSUS (*hydrous wool-fat—lanolin*) is the purified fat of the wool of sheep (Ovis Aries) mixed with not more than 30 per cent. of water.

SEVUM (*suet*), the internal fat of the abdomen of Ovis Aries (the sheep), consists, when purified, almost entirely of stearine.

CETACEUM (*spermaceti*), a peculiar, concrete, fatty substance obtained from Physeter macrocephalus or sperm-whale. A *cerate* (*ceratum cetacei*) is official, and it also enters into the preparation of *cold cream.*

CERA FLAVA (*yellow*) and CERA ALBA (*white wax*). The former is a peculiar, concrete substance, prepared by Apis mellifica, or honey bee. The latter is the former which has been bleached. They are used in making cerates, plasters, and ointments.

ACIDUM OLEICUM (*oleic acid*), used chiefly in preparing the oleates of mercury and veratrine.

GLYCERINUM (*glycerin*) is the hydrate of glyceril and exists in *animal oils* combined with fatty acids. Internally it is nutrient, *demulcent, and, in* large doses, laxative. Administered by the bowel it is laxative even in small amounts, for which purpose the *suppositories* (*suppositoria glycerini*) are much used. Locally, it is much used as an emollient. *Glyceritum Vitelli* (*glycerite of yolk of egg*) is used in making emulsions. *Glycerite of starch* (*v.* "*Amylum*") is used externally.

The *glycerites of carbolic acid*, *of tannic acid*, *of boroglycerin*, and *of hydrastis* are also official.

OLEUM THEOBROMATIS (*oil of theobroma*) or cacao-butter, is the *fixed oil expressed* from the *seed* of Theobroma Cacao (*Nat. Ord.* Sterculiaceæ), and is used as an unguent and to give form and consistence to suppositories.

OLEUM GOSSYPII SEMINIS (*cottonseed oil*), *a fixed oil expressed* from the *seed* of Gossypium herbaceum (*q. v.*), is used as a substitute for almond or olive oil, and enters into the composition of numerous liniments.

OLEUM SESAMI (*oil of sesamum—oil of benne*) is a *fixed oil expressed* from the *seed* of Sesamum indicum (*Nat. Ord.* Pedaliaceæ). It is used for the same purposes as cottonseed oil.

PETROLATUM MOLLE (*soft petrolatum*) is a mixture of hydrocarbons, chiefly of the marsh-gas series, obtained by distilling off the lighter and more volatile portions from petroleum and purifying the residue.

It differs from *Petrolatum Liquidum* (*liquid petrolatum*) and from *Petrolatum Spissum* (*hard petrolatum*) chiefly in its consistence, in its melting-point, and in its specific gravity. The latter is of the consistence of cerate, and the former that of an oil, while soft petrolatum more nearly approaches that of an ointment. Under the names of vaseline and cosmoline, the heavier petroleum oils are much used externally as emollients and as a basis for ointments, and internally to allay irritation of the mucous membranes.

Many of the "*Demulcents*" also are employed in the form of poultices as emollients.

Class V.—Protectives.

What are protectives?

Protectives are substances used to exclude light or air from the surface to which they are applied, or otherwise to protect it from injurious influences. Many *surgical appliances* are thus "protectives," but do not belong to the domain of "Materia Medica." The *plasters* and *unguents*, when simply used to protect the surface, come under this class. The following agents have not been previously considered: Collodion, solution of gutta-percha and solution of sodium silicate.

What are these substances?

Calcii Sulphas Exsiccatus (*dried gypsum*, *dried calcium sulphate or plaster of Paris*) is a powder containing about 95 per cent., by weight, of calcium sulphate.

It is used as a permanent dressing in the treatment of fractures, caries of the vertebræ, etc., where it is necessary to give continual support to the parts for some time. For this purpose it is moistened and thoroughly rubbed into successive layers of previously moistened roller bandage. It *sets* very rapidly, forming with the bandage a stiff, board-like support.

Collodium (*collodion*) is a solution of *pyroxylin* or soluble guncotton (*pyroxylinum*) (4 per cent.), in stronger ether and alcohol. When applied to the skin, the solvents rapidly evaporate, leaving a colorless, transparent, flexible and strongly contractile film, closely adherent, difficult to detach, and impervious alike to air and water. It has been used in surgery as an antiphlogistic in inflammation, on account of its contractile power, and also applied on gauze, as a substitute for adhesive plaster in the treatment of wounds. Its contractile power is an objection to its use as a simple protective, for which purpose it is better to employ *flexible collodion* (*collodium flexile*), which contains Canada turpentine (5 per cent.) and castor oil (3 per cent.), and is more pliable and elastic. *Styptic collodion* (*collodium stypticum*) contains, in addition to collodion, tannic acid (20 per cent.), ether (25 per cent.), and alcohol (5 per cent.).

Elastica (*India rubber or caoutchouc*) is the prepared *milk-juice* of various species of Hevea (*Nat. Ord.* Euphorbiaceæ), known in commerce as *Para Rubber.* It is used in making plasters, bougies, etc., and has been used dissolved in commercial chloroform as a protective to small abrasions, chaps, threatened bedsores, etc.

Liquor Sodii Silicatis (*solution of sodium silicate*), commonly called *solution of soluble glass*, is principally used in the treatment of fractures, applied on successive layers of roller bandage as a permanent dressing.

Class VI.—Coloring Agents.

What are coloring agents?

They are employed almost exclusively to give their particular color to tinctures, spirits and ointments, and are—

Coccus (*cochineal*), the *female dried insect.* Coccus cacti, a native of Mexico and Central America, containing *carminic acid*, to which it owes its peculiar red color. It has been used also as an *antispasmodic;* dose gr. ⅓ (0.02), t. i. d.

Crocus (*saffron*), the stigmas of Crocus sativus (*Nat. Ord.* Irideæ), contains *safranin.* A *tincture* (*tinctura croci*) is official.

Santalum Rubrum (*red saunders*), the *wood* of Pterocarpus santalinus (*Nat. Ord.* Leguminosæ), contains *sandal*, *santalic acid*, and *pterocarpin*, and is used to give a red color to pharmaceutical preparations.

INDEX.

ABSINTHIUM, 40
Acacia, 263
  mucilage of, 263
  syrup of, 263
Aceta, 22
Acetanilid, 80, 81
Acetanilidum, 80, 81
Acetic acid, 168
    diluted, 168
    glacial, 168
Acetphenetidin, 81
Acetum opii, 94
  scillæ, 208
Acid nitrate of mercury, 63
Acids, 168, 169
Acidum aceticum, 168
    dilutum, 168
    glaciale, 168
  arsenosum, 69, 261
  benzoicum, 252
  boricum, 249, 250
  carbolicum, 250, 251
  citricum, 168, 169
  gallicum, 230
  hydrobromicum dilutum, 99
  hydrochloricum, 58
  hydrocyanicum dilutum, 139, 141
  lacticum, 59
  nitricum, 57
  nitrohydrochloricum, 58
  oleicum, 266
  phosphoricum, 58
  sulphuricum, 57
  sulphurosum, 248
  tannicum, 229
  tartaricum, 169
Aconine, 162
Aconite, 162-164, 218
  preparations and doses of, 163, 164
Aconitine, 162-164
Aconitum, 162, 164
Adeps, 265
  benzoinatus, 226
  lanæ hydrosus, 266
Administration of medicines, 32
Adonidin, 156, 157
Æther, 116-119, 149
  fortior, U. S. P. 1880, 119
  preparations of, 119
Alcohol, 146-149
  absolutum, 148
  official *preparations*, 148, 149
Alcoholic extract of belladonna leaves, 110
Alkaloids, cinchona, 42, 46
Allium, 225
Allspice, 184
Allyl, sulphocyanide, 256
Almonds, preparations of, 142
Aloe purificata, 192
Aloes, 192
  pills of asafœtida and, 128
Aloin, 192
Aloinum, 192
Alteratives, 59-77
Althea, 264
Alum, 181, 236, 262
Alumen, 181, 236
Alumini sulphas, 236
Aluminum sulphate, 236
Amidophenacetin, 81, 82
Ammonia, 151, 242, 257
  gas, 149
  liniment, 257
  stronger water of, 259
Ammoniac, 222, 226
Ammoniacum, 226
Ammoniated glycyrrhizin, 265
  mercury, 63
  tincture of guaiac, 75
Ammonii benzoas, 252
  bromidum, 99
  carbonas, 151
  chloridum, 72, 73, 223
  iodidum, 66
  valerianas, 127
Ammonium, 149, 151
  acetate, solution of, 219
  benzoate, 252
  carbonate, 151
  chloride, 72, 73, 222, 223
  iodide, 66
  muriate, 223
  valerianate, 127
Amulsum amygdalæ, 142
Amyl nitris, 138, 151
  nitrite, 138, 151
Amylum, 265, 267
Anæsthetics. 116, 123
Anemonic acid, 167
Anemonii, 167
Anise, 187
Anisum, 187
Anthemis, 39, 41

Antifebrin, 80, 81
Antimonial ointment, 269
  powder, 161
Antimonii et potassii tartras, 161, 181
  oxidum, 161
  sulphidum, 162
  sulphidum purificatum, 162
  sulphuratum, 162
Antimonium, 159, 162
  and potassium tartrate, 161, 181
Antimonious oxide, 161
  sulphide, 162
Antimony, 159, 162
Antipyretics, 77, 89
Antipyrine, 78, 80, 116
Antispasmodics, 126, 130
Apiol, 177
Apocynum, 210
Apomorphine, 222
  hydrochlorate, 179, 180
Apothecaries' measure, 24
    relation of, to metrical system, 25
  weight, 23
    relation of, to metrical system, 25
Approximate measurements, 26
Aqua, 262
  ammoniæ, 151
    fortior, 151, 259
  amygdalæ, 144
  anisi, 187
  aurantii florum fortior, 187
  camphoræ, 129
  chloroformi, 121
  cinnamomi, 184
  creosoti, 252
  destillata, 263
  fœniculi, 187
  hydrogenii dioxidi, 244, 245
  menthæ piperitæ, 186
    viridis, 186
  pagliarii, 236
  rosæ, 232
Aquæ, 21
Arbutin, 212
Argenti cyanidum, 141, 240
  iodidum, 240
  nitras, 240
    dilutus, 240
    fusus, 240
  oxidum, 240
Argentum, 239, 240
Arnica, effects and uses of, 167
  flowers, tincture of, 167
  fluid extract of, 167
  plaster of, 167
  root, extract of, 167
  tincture of, 167
Arnicin, 167
Aromatic bitters, 39-41
    preparations and doses of, 41
  elixir, 188
  powder, 185
  spirit of ammonia, 151
  sulphuric acid, 57
Arsenic, 67-70
Arsenic iodide, 69
  preparations and doses of, 69
  symptoms and treatment of poisoning by, 68, 69
Arseni iodidum, 69
Arsenous acid, 69, 261
Arsenum, 69-70
Asafœtida, 127, 128
  emulsion of, 128
  pills of, 128
  pills of aloes, etc., 128
  preparations and doses of, 128
  tincture of, 128
Asclepias, 222, 224
  fluid extract of, 224
Aspidium, 200
Aspidosperma, 224
  fluid extract of, 224
Atropinæ, 152
Atropine, 107-110, 152, 220
  sulphas, 110
  treatment of poisoning by, 108, 109
Aurantii amari cortex, 187
  dulcis cortex, 187
Auri et sodii chloridum, 64
Aurum, 64

BALSAM OF FIR, 214
  Peru, 227
  tolu, 222, 227
Balsamum peruvianum, 227
  tolutanum, 222, 227
Bark of cotton root, 173, 174
Basham's mixture, 50
Belladonna, 107, 110
  liniment of, 110
  ointment of, 110
  plaster of, 110
  root, fluid extract of, 110
  tincture of, 110
  treatment of poisoning by, 108, 109
Benne, oil of, 267
Benzoic acid, 226, 252
Benzoin, 222, 226
  compound tincture of, 226
  tincture of, 226
Benzoinated lard, 226, 266
Benzoinum, 226
Berberine, 37, 39, 46
Beta-naphtol, 243
Bismuth, 240, 244
  and ammonium citrate, 241
  subcarbonate, 241
  subnitrate, 241
Bismuthi et ammonii citras, 241
  subcarbonas, 241
  subnitras, 241
Bismuthum, 240, 241
Bitter almond, water of, 141
    essence of, 142
    spirits of, 141, 142
  tonics, 37
  wine of iron, 51
Bitters, 37-39
  aromatic, 39-41

Bitters, peculiar, 42–47
  simple, 37–39
Black draft, 193
  drop, 94
Blaud's pills, 49
Blue gum tree, 39
  mass, 61, 62, 193
  ointment, 62
  stone, 237
  vitriol, 237
Borax, 249, 250
Boric acid, 249, 250
Brandy, 148
Brayera, 201
Bromide of ammonium, 99
  calcium, 99
  potassium, 99
  sodium, 99
  strontium, 99
  zinc, 99
Bromides, 98, 99, 136
Bromine, 246
Bromoform, 123
Bromum, 246
Brown mixture, 265
Brucine, 131
Bryonia, 196
Bryony, 196
Buchu, 211
  fluid extract of, 211
Burdock, 77
Burgundy, 257
Burnett's disinfecting fluid, 238
Butyl chloral hydrate, 97

CAFFEINA, 155, 156
  citrata, 156
  effervescens, 156
Caffeine, 155, 156, 208
  administration of, 156
  citrated, 156
    effervescent, 156
Cajuput, oil of, 185
Calamus, 185
  fluid extract of, 185
Calcii bromidum, 99
  carbonas præcipitatus, 243
  chloridum, 72
  hypophosphis, 72
  phosphas præcipitatus, 72
  sulphas exsiccatus, 268
Calcined magnesia, 194
Calcium, 243
  chloride, 72
  hypophosphite, 72
  phosphate, 71, 72
  sulphate, dried, 268
Calendula, 76
  tincture of, 76
Calomel, 62, 139, 211
Calumba, 37, 38, 39
Calumbo, 38, 39
Calx chlorata, 246
  sulphurata, 249
Cambogia, 197

Campeachy wood, 232
Camphor, 128, 129
  cerate, 129
  liniment, 129
  monobromated, 129
  preparations and uses of, 129
  spirit of, 129
  water of, 129
Camphora, 128, 129
  monobromata, 129
Camphorated tincture of opium, 94
Canada balsam, 214
Canadensis, 46
Cannabis Indica, 104, 105
  extract of, 105
  fluid extract of, 105
  tincture of, 105
Cantharidal collodion, 259
Cantharides, 177, 217, 258, 259
  tincture of, 217, 259
Cantharis, 217, 258, 259
  vesicatoria, 258
  vittata, 259
Caoutchouc 269
Capsicum, 183, 257
  fluid extract of, 183
  oleoresin of, 183
  plaster of, 183
  tincture of, 183
Capsules, 23
Caraway, 187
Carbolic acid, 250, 251
  crude, 251
  glycerite of, 251
  ointment of, 251
Cardamom, 185
  compound tincture of, 185
  tincture of, 185
Cardamomum, 185
Carica papaya, 35
Carrageen, 265
Carron oil, 243
Carum, 187
Caryophyllus, 184
Cascara sagrada, 189
Cascarilla, 39
Cassia cinnamon, 183, 184
  fistula, 189
Castanæ, 233
  fluid extract of, 233
Castor oil, 189, 190, 191
Catechu, 231
  compound tincture of, 231
  troches of, 231
Caustic soda, 242, 261
Celandine, 197
Centimeter, 24
Cera alba, 266
Cera flava, 266
Cerata, 21
Cerates, 20, 21
Ceratum camphoræ, 129
  cantharidis, 259
  cetacei, 266
  plumbi subacetatis, 235

- Cerii oxalas, 241
- Cerium oxalate, 241
- Cetaceum, 266
- Cetraria, 265
  - islandica, 265
- Chalk, 243
  - compound powder, 243
  - mixture, 243
  - prepared, 243
  - troches of, 243
- Chamomile, 39
  - German, 39
- Charta potassii nitratis, 205
- Charta sinapis, 257
- Chartæ, 20
- Chelidonium, 197
- Chenopodium, 200
  - oil of, 200
- Chian turpentine, 214
- Chimaphila, 212
  - fluid extract of, 212
- Chinoline, 89
- Chirata, 37, 39
- Chiratæ, 39
- Chittem bark, 189
- Chloral, 95–97, 136
  - treatment of poisoning by, 96
- Chloralamide, 97
- Chloralose, 97, 98
- Chlorinated lime, 246
  - soda, solution of, 247
- Chlorine-water, 245, 246
- Chloroform, 119–121
  - emulsion of, 121
  - liniment of, 121
  - preparations of, 121
  - spirit of, 121
  - water, 121
- Chloroformum, 119–121.
- Choline, 106
- Chondrus, 265
- Cimicifuga, 158, 159
  - extract of, 159
  - fluid extract of, 158
  - tincture of, 159
- Cinchona, 42–46
  - administration of, 46
  - alkaloids, 42–46
  - calisaya, 42
  - chemical constituents of, 427
  - condaminea, 42
  - infusion of, 45
  - micrantha, 42
  - pallida, 42
  - succirubra, 42
- Cinchonicine, 43
- Cinchonidinæ sulphas, 45
- Cinchonidine, 42
  - sulphate, 45
- Cinchonæ sulphas, 45
- Cinchonine, 42
  - sulphate, 45
- Cinnamomum cassia, 183, 184
  - *saigonicum, 183*
  - *zeylanicum, 184*
- Cinnamon, 183, 184
  - oil of, 184
  - spirit of, 184
  - tincture of, 184
  - water of, 184
- Citric acid, 168, 169
  - syrup of, 169
- Citrine ointment, 63
- Classification of medicines, 33
- Cloves, 184
  - oil of, 184
- Coca, 113–115
  - preparations and doses of, 115
- Cocainæ hydrochloras, 115
- Cocaine, 114, 124, 125
  - hydrochlorate, 115
  - treatment of poisoning by, 114, 115
- Coccus, 269
- Cochineal, 269
- Codeine, 95
- Cod-liver oil, 70, 71
  - dose and administration, 71
- Colchicia, 73
- Colchicine, 73, 74
- Colchicum, 74
  - fluid extract of; 74
  - preparations and doses of, 74
  - root, extract of, 74
    - fluid extract of, 74
- Cold cream, 232
- Collodion, flexible, 268
  - styptic, 268
- Collodium cantharidatum, 259
  - flexile, 268
  - stypticum, 268
- Colocynth, 197
- Colocynthis, 197
- Compound cathartic pills, 198
  - decoction of sarsaparilla, 75
  - effervescing powder, 195
  - fluid extract of sarsaparilla, 75
  - glycyrrhiza mixture, 265
  - liquorice powders, 265
  - pills of antimony, 162
  - powder of morphine, 94
  - solution of iodine, 66
  - syrup of sarsaparilla, 75
    - squill, 161
- Confectio rosæ, 232
  - sennæ, 193
- Confectiones, 20
- Confections, 20
- Conium, 143–144
  - extract of, 143
  - fluid extract of, 144
  - preparations and doses of, 143, 144
- Conserves, 20
- Convallamarin, 159
- Convallaria, 159
  - fluid extract of, 159
- Convallarin, 159
- Conydrine, 143
- Copaiba, 216
  - massa, 216
  - oil of, 216

Copper, 237
  sulphas, 181
  sulphate, 237, 262
Copperas, 49
Coriander, 187
Coriandrum, 187
Cornutin, 171
Corrosive sublimate, 60, 61, 211
    treatment of poisoning by, 61
Cotton bark, 174
    fluid extract of, 174
  root, 173, 174
Cottonseed oil, 267
Court-plaster 265
Cowling's rule for dose in children, 31
Coxe's hive-syrup, 161, 208
Cream of tartar, 195, 205
Cremor tartari, 195
Creosote, 252
  water, 252
Creosotum, 252
Cretæ præparata, 243
Crocus, 269
  tincture of, 269
Croton chloral hydrate, 97
  eluteria, 39
  oil, 198, 260
Cubeb, 216
Cubeba, 216
  fluid extract of, 217
  oil of, 217
  oleoresin of, 217
  tincture of, 217
  troches of, 217
Cubebin, 216
  acid, 216
Cupri sulphas, 181, 237
Cuprum, 237
Curare, 144
Curarine, 144
Cusso, 201
Cyanids, 141
Cypripedium, 130
  fluid extract, 130

DATURINE, 111
Decimal system, 24, 25
  relation to apothecaries' weight and measure, 25, 26
  weights and measures, 24, 25
Decocta, 22
Decoctions, 20, 22
Decoctum cetrariæ, 265
  sarsaparillæ compositum, 75
Definitions, 18–23
Depresso-motors, 134, 145
Diachylon ointment, 235
Digallic acid, 229
Digestants, 35, 37
Digitalein, 152
Digitalin, 152
Digitalis, 152–154, 208
  extract of, 154
  fluid extract of, 154
  infusion of, 154
Digitalis, preparations of, 154
  tincture of, 154
Digitalosmin, 152
Digitin, 152
Digitonin, 152
Digitoxin, 152
Diluted hydrobromic acid, 99
  hydrocyanic acid, 139–141
Dional, 100
Dispensatory, 19
Donovan's solution, 69
Dosage, 29–32
Dover's powder, 94, 218
Dried gypsum, 268
Duboisia, 113
Duboisine, 113
Dulcamara, 77
  fluid extract of, 77

EFFERVESCENT MAGNESIUM CITRATE, 194
Effervescing draught, 204
Elastica, 269
Elaterin, 198
Elaterinum, 198
Elixir aromaticum, 188
  phosphorii, 55
  phosphorus, 55
  vitriol, 57
Ellis' magnesia, 194
Elm, 264
Emetine, 178
Emplastra, 21
Emplastrum, ammoniaci cum hydrargyri, 62, 226
  arnicæ, 167
  belladonnæ, 110
  capsici, 183
  ferri, 49
  hydrargyri, 62
  ichthyocollæ, 265
  opii, 94
  picis cum cantharidê, 258
    burgundicæ, 258
  plumbi, 235
  saponis, 235
Emulsa, 23
Emulsion of almonds, 263
Emulsions, 23
Emulsum, ammoniaci, 226
  amygdalæ, 263
  asafœtida, 128
  chloroformi, 121
Enemata, 23, 199
Epsom salt, 194
Ergot, 170, 173
  extract of, 172
  fluid extract of, 173
  preparations and doses of, 172, 173
  wine of, 173
Ergota, 170, 173
Eriodictyon, 222, 225
  fluid extract of, 225
Erythema, 44
Erythroxylon, 113
  fluid extract of, 115

Ether, 116–119, 130
  compound spirit of, 130
  preparations of, 119
  spirit of, 119
Ethereal oil, 130
Ethyl bromide, 122, 123
  chloride, 124
  hydrate, 146
  nitrite, 219
  oxide, 116–119
Eucaine, 125
Eucalyptol, 41
Eucalyptus, 39, 41, 222, 228
  fluid extract of, 41
Euonymus, 193
Eupatorium, 39
  fluid extract of, 41
Excito-motors, 130–134
Extracta, 20
  fluida, 22
Extracts, 20
  fluid, 20-22
Extractum aconiti, 163
    fluidum, 163
  aloës, 192
  apocyni fluidum, 210
  arnicæ radicis, 167
      fluidum, 167
  aromaticum fluidum, 185
  asclepiadis fluidum, 224
  aspidospermatis fluidum, 224
  aurantii amari fluidum, 188
    dulcis fluidum, 188
  belladonnæ foliorum alcoholicum, 110
    radicis fluidum, 110
  buchu fluidum, 211
  calami fluidum, 185
  cannabis indicæ, 105
      fluidum, 105
  capsici fluidum, 183
  castanæ fluidum, 233
  chimaphilæ fluidum, 212
  cimicifugæ, 159
    fluidum, 158
  cinchonæ, 45
    fluidum, 45
  cocæ fluidum, 115
  colchici radicis, 74
      fluidum, 74
    seminis fluidum, 74
  colocynthidis, 197
    compositum, 197
  conii, 143
    fluidum, 144
  convallariæ fluidum, 159
  cubebæ fluidum, 217
  cusso fluidum, 201
  cypripedii fluidum, 130
  digitalis, 154
    fluidum, 154
  dulcamaræ fluidum, 77
  ergotæ, 173
    fluidum, 174
eriodicyti fluidum, 225
Extractum eucalypti fluidum, 41
  euonymi, 193
  eupatorii fluidum, 41
  frangulæ fluidum, 189
  gelsemii fluidum, 139
  geranii fluidum, 232
  glycyrrhizæ, 264
    fluidum, 264
    purum, 264
  gossypii radicis fluidum, 174
  grindeliæ fluidum, 222
  guaranæ fluidum, 156
  hæmatoxyli, 232
  hamemelidis fluidum, 232
  hydrastis fluidum, 47
  hyoscyami, 112
    fluidum, 112
  ipecacuanhæ fluidum, 179
  iridis, 197
    fluidum, 197
  jalapæ, 196
  juglandis, 192
  krameriæ, 231
    fluidum, 231
  lappæ fluidum, 77
  leptandræ, 193
    fluidum, 193
  lobeliæ fluidum, 142
  lupulini fluidum, 106
  matico, 217
  menispermi fluidum, 76
  mezerei fluidum, 76
  nucis vomicæ, 133
      fluidum, 133
  opii, 93
  pareiræ fluidum, 212
  physostigmatis, 136
  pilocarpi fluidum, 221
  podophylli, 196
    fluidum, 196
  pruni virginianæ fluidum, 41
  rhamni purshiana fluidum, 189
  rhei, 191
    fluidum, 191
  rhois glabræ fluidum, 233
  rosæ fluidum, 232
  sabinæ fluidum, 176
  sanguinariæ fluidum, 225
  sarsaparillæ fluidum, 75
    compositum, 75
  scillæ fluidum, 208
  scoparii fluidum, 210
  scutellariæ fluidum, 130
  senegæ fluidum, 224
  sennæ fluidum, 193
  serpentariæ fluidum, 41
  spigeliæ fluidum, 200
  stillingiæ fluidum, 77
  stramonii seminis, 111
      fluidum, 111
  taraxaci, 210
    fluidum, 210
  tritici fluidum, 212
  uvæ ursi, 212
      fluidum, 212

Extractum valerianæ fluidum, 127
  veratri viridis fluidum, 165
  viburnum fluidum, 175
  zeæ fluidum, 214
  zingiberis fluidum, 185

Fennel, 186
Ferri carbonas saccharatus, 49
  chloridum, 50
  citras, 50
  et ammonii citras 51
      sulphas, 51
      tartras, 51
    potassii tartras, 51
    quininæ citras, 51
      solubilis, 51
    strychninæ citras, 51
  hypophosphis, 50
  iodidum saccharatum, 50
  lactas, 51
  oxidum hydratum, 49
      cum magnesia, 49
  phosphas solubilis, 50
  pyrophosphas, 50
  sulphas, 49
    exsiccatus, 49
    granulatus, 49
  valerianas, 51
Ferric ammonium sulphate, 51
  chloride, 50
  citrate, 50
  hypophosphite, 50
  valerianate, 51
Ferrous carbonate, mass of, 49
  iodide, pills of, 50
  lactate, 51
  sulphate, 49
    dried, 49
    granulated, 49
Ferrum, 47–52
  reductum, 49
Flaxseed, 264
  tea, 264
Flower of sulphur, 190
Fluid extracts, 20, 22
Fœniculum, 187
Fomentations, 23
Formaldehyd, 254
Formalin, 254
Formic aldehyd, 254
Formyl terchloride, 119
Fowler's solution, 69
Frangula, 189

Galla, 231
  ointment of, 231
  tincture of, 231
Gallic acid, 230
Gallo-tannic acid, 229
Gamboge, 197
Gargles, 23
Garlic, 222, 225
Gaultheria, 186
  oil of, 186
  spirit of, 186
Gelatine, 265
Gelsemine, 138
Gelseminic acid, 138
Gelseminine, 138
Gelsemium, 138, 139, 166
  fluid extract of, 139
  preparations and doses of, 139
  tincture of, 139
Gentian, 37, 38, 39
Gentiana, 37
Gentianæ, 38
Gentisic acid, 37
Gentisin, 37
Geranium, 232
  fluid extract of, 232
Ginger, 184, 185
  fluid extract of, 185
  oleoresin of, 185
  syrup of, 185
  tincture of, 185
  troches of, 185
Glauber's salt, 194, 195
Glycerin, 266, 267
Glycerinum, 266, 267
Glycerita, 22
Glycerite of boroglycerin, 250, 267
    of carbolic acid, 267
    glyceryl borate, 250
    hydrastis, 267
    starch, 267
      or plasmine, 265
    tannic acid, 267
    yolk of egg, 267
Glycerites, 20, 22
Glyceritum acidi carbolici, 251
    tannici, 230
  amyli, 265
  boroglycerini, 250
  hydrastis, 47
  vitelli, 267
Glycyrrhiza, 264
  extract of, 264
  fluid extract of, 264, 265
  refined extract of, 264
  troches of opium and, 94
Glycyrrhizinum ammoniatum, 265
Gold, 64
  and sodium chloride, 64
  preparations and doses of, 64
  salts, 64
Golden seal, 46
Gossypii radicis cortex, 173, 174
Goulard's extract, 235
  cerate, 235
Gramme, 24
Granatum, 200
Granules, 23
Granville's vesicating lotion, 259
Gray powder, 62
Green vitriol, 49
Griffith's anti-hectic mixture, 49
Grindelia, 2 22
  fluid extract of, 222
Grondret's vesicating ointment, 258
Guaiac, 75, 177

Guaiac acid, 75
  beta-resin, 75
  preparations and doses of, 75
  resina, 75
  wood, 75
  yellow, 75
Guaiaci lignum, 75
Guaiacin, 75
Guaiacol, 86, 88, 126
  carbonate, 86–88
Guaiaconic acid, 75
Guarana, 156
  fluid extract of, 156
Gum arabic, 263
Gypsum, dried, 268

HÆMATOXYLON, 232
  extract of, 232
Hamamelis, 232
  fluid extract of, 232
Hedeoma, 186
Henry's magnesia, 194
Hoffmann's anodyne, 130
Homatropine hydrobromate, 110
Honey, 20, 22
Hope's camphor mixture, 129
Horehound, 186
Humulus, 106
  tincture of, 106
Husband's magnesia, 194
Hydrargyri chloridum corrosivum, 62, 63, 246, 261
    mite, 62, 193, 201
  cyanidum, 63
  iodidum flavum, 63
    rubrum, 63, 246
  oxidum flavum, 62
    rubrum, 62
  subsulphas flavus, 63, 181
Hydrargyrum, 60–64
  ammoniatum, 63
  cum cretæ, 62
  preparations and doses of, 61–63
Hydrastine, 46
Hydrastininæ hydrochloras, 47, 173
Hydrastinine hydrochlorate, 47, 173
Hydrastis, 42, 46, 45, 173
  fluid extract of, 47
  glycerite of, 47
  preparations and doses of, 47
  tincture of, 47
Hydrate, 222
Hydrated ferric oxide, 49
    with magnesia, 49
Hydrochloric acid, 56, 58
    diluted, 58
  ether, 124
Hydrocyanic acid, 139, 141
Hydrogen dioxide, solution of, 244, 245
  peroxide, 244, 245
Hydroquinone, 88, 89
Hydrous wool-fat, 266
Hyoscinæ hydrobromas, 100
Hyoscine hydrobromate, 100
Hyoscyaminæ hydrobromas, 113
Hyoscyaminæ sulphas, 112, 113
Hyoscyamine hydrobromate, 113
  sulphate, 112, 113
Hyoscyamus, 111, 113
  extract of, 112
  fluid extract of, 112
  preparations and doses of, 112, 113
  tincture of, 112
Hypnotics, 90–106
Hypophosphites, 71, 72
  preparations and doses of, 72

ICELAND MOSS, 265
Ichthyocolla, 265
Igasuric acid, 131
Igasurine, 131
Illicum, 187
India rubber, 269
Indian cannabis, 104, 105
    preparations and doses, 105
Infusa, 22
Infusions, 20, 22
Infusum cinchonæ, 45
  digitalis, 154
  pruni virginianæ, 41
  sennæ compositum, 193
Ingluvin, 35, 36
Inhalations, 23
Injections, 23
Iodides, 65-67
  preparations and doses of, 66, 67
Iodine, 65–67, 246
  ointment, 66
  preparations and doses of, 66, 67
  treatment of poisoning by, 65
Iodoform, 247, 248
  ointment, 247
Iodoformum, 247, 248
Iodol, 248
Iodum, 65–67, 246
Ipecac, 178, 218, 222
  fluid extract of, 179
  powder of opium and, 90, 179
  preparations and doses of, 179
  syrup of, 179
  tincture of opium and, 90, 179
  troches of, 179
Ipecacuanha, 178, 179
  preparations and doses of, 179
Ipecacuanhic acid, 179
Iris, 197
  extract of, 197
  fluid extract of, 197
Irish moss, 265
Iron, 47–52
  and ammonium tartrate, 51
      citrate, 51
    potassium tartrate, 51
    quinine citrate, 51
    strychnine citrate, 51
  carbonate, pills of, 49
  compound mixture of, 49
  plaster of, 49
  preparations and doses of, 49–51
  reduced, 49

Iron sulphate, 39
  therapeutic uses of, 48, 49
  troches of, 49
Isaconitine, 162
Isinglass, 265
Isonaphthol, 253

JABORANDINE, 220
Jalap, 196
  compound powder of, 196
  extract of, 196
  resin of, 196
Jalapa, 196
James' powder, 161
Jervine, 164
Juglans, 191
Juniper, 213
  compound spirit of, 213
  spirit of, 213
Juniperus, 213

KAIRINE, 89
Kamala, 201
Kermes mineral, 162
Kino, 231
  powder, 231
  tincture of, 231
  tannic acid, 229
Kousso, 201
Krameria, 231
  extract of, 231
  fluid extract of, 231
  syrup of, 231
  tincture of, 231
  troches of, 231

LABARRAQUE'S SOLUTION, 246
Lac asafœtidæ, 128
Lactic acid, 59
    preparations and doses of, 59
Lactucarium, 106
  syrup of, 106
  tincture of, 106
Lady Webster's dinner pills, 192
Lanolin, 266
Lappa, 77
  fluid extract of, 77
Lard, 266
Laudanum, 94
Lauder Brunton's rule for dose in children, 31
Lavender, compound tincture of, 186
  flowers, oil of, 186
  spirit of, 186
Lead, 233, 236
  carbonate, 235, 236
  iodide, 235
  nitrate, 235
  ointment, 235
  oxide, 235
  preparations of, 235
  subacetate, cerate of, 235
    solution of, 235
      diluted, 235
  sugar of, 235
Ledoyen's disinfecting fluid, 235
Lemon, essence of, 169
  juice of, 169
  oil of, 169
  spirit of, 169
Leptandra, 193
Lime liniment, 243
  solution, 243
  syrup of, 243
  water, 243
Limonis succus, 169
Linimenta, 21
Liniments, 20, 21
Linimentum ammoniæ, 257
  belladonnæ, 110
  calcis, 243
  camphoræ, 129
  chloroformi, 121
  saponis, 129
  sinapis compositum, 257
  terebinthinæ, 216
Linum, 264
Liquids, 19, 20
Liquor acidi arsenosi, 69
  ammonii acetatis, 219
  arseni et hydrargyri iodidi, 69
  ferri acetatis, 50
    chloridum, 50
    citratis, 50
    et ammonii acetatis, 50
    nitratis, 50
    subsulphatis, 50
    tersulphatis, 50
  hydrargyri nitratis, 63, 261
  iodi compositus, 66
  magnesii citratis, 194
  plumbi subacetatis, 235
      dilutus, 235
  potassæ, 204
  potassii arsenitis, 69
    citratis, 204
  sodæ, 242
    chloratæ, 246
  sodii arsenatis, 69
    silicatis, 269
  zinci chloridi, 239
Liquorice, 193, 264
  compound powder of, 198
  root, 264
Liquores, 21
Litharge, 235
Lithii benzoas, 206
  carbonas, 206
  citras, 206
    effervescens, 206
Lithium, 206
  benzoate, 206
  bromide, 206
  carbonate, 206
  citrate, effervescent, 206
  salicylate, 206
Lobelia, 142, 222
  fluid extract of, 142
  preparations and doses of, 142
  tincture of, 142

Lobelic acid, 142
Lobeline, 142
Local anæsthetics, 123-126
Logwood, 232
London paste, 261
Lotions, 23
Lozenges, 19, 20
Lugol's solution, 66, 67
Lupulin, 106
  fluid extract of, 106
  oleoresin of, 106
Lupulinum, 106
Lycopodium, 165

MACE, 184
Macis, 184
Magendie's solution, 94
Magnesia, 194
  alba, 194
  ponderosa, 194
Magnesii carbonas, 194
  citras effervescens, 194
  sulphas, 194
Magnesium carbonate, 194
  citrate, effervescent, 194
    solution of, 194
  sulphate, 194
Manganese, 52, 53
  dioxide, 53
  preparations and doses of, 53
  sulphate, 53, 195
Mangani dioxidum, 53
  sulphas, 53, 195
Manganum, preparations and doses of, 52, 53
Manna, 189
Marrubium, 186
Massa copaibæ, 216
  hydrargyri, 61, 62, 193
Materia medica, 17
    proper, 17
Matico, 217
  fluid extract of, 217
  tincture of, 217
Matricaria, 39, 41
Measure, wine, 24
Measurements, approximate, 26
Measures, 23, 26
Mellita, 22
Mel rosæ, 232
Menispermum, 76
  fluid extract of, 76
Mentha piperita, 186
  viridis, 186
Menthol, 125, 126
Mercurial cathartics, 193
  ointment, 62
  oleate, 62
  plaster, 62
Mercuric chloride, 62, 63, 246, 261
  cyanide, 63
  iodide, 63, 246
Mercurous chloride, 62, 193
  iodide, 63
Mercury, 60-64
Mercury, mass of, 61, 62
  metallic, 60
  preparations and doses of, 61-63
  with chalk, 62
Methenyl chloride, 119
Methyl-conine, 143
Methylene bichloride, 122, 123
Methylpyrocatechin, 86, 88
Metrical weights, 24, 25
Mezereon, 75, 76
  fluid extract of, 76
Mezereum, 75, 76
Mineral acids, 55, 59
    names of, 56
    therapeutic uses of, 56
    treatment of poisoning by, 56
  tonics, 47, 59
Mistura cretæ, 243
  ferri compositæ, 49
  glycyrrhizæ compositæ, 265
  rhei et sodæ, 191
Misturæ, 21
Mixtures, 20, 21
Morphinæ acetas, 94
  hydrochloras, 94
  sulphas, 94
Morphine acetate, 94
  hydrochlorate, 94
  sulphate, 94
  troches of ipecac and, 94
Moschus, 126, 127
Mucilago acaciæ, 263
  sassafras medullæ, 264
  tragacanthæ, 264
  ulmi, 264
Muriatic acid, 58
    diluted, 58
Musk, 126, 127
  preparations of, 127
  tincture of, 127
Mustard, 180, 181
  black, 256, 257
  liniment, 257
  papers, 257
  volatile oil of, 257
  white, 256, 257
Mydriatic anodynes, 107, 116
Myristica, 184

NAPHTALIN, 253
Naphtalinum, 253
Naphthalin, 253
Naphtol, 253
Neutral mixture, 204
Nicotianin, 144
Nicotine, 144
Nitre, 205
Nitric acid, 56, 57
    diluted, 57
Nitrites, 136-138
  preparations and doses of, 138
Nitrogen monoxide, 122
Nitroglycerin, 151
  triturates of, 138
Nitrohydrochloric acid, 56-58

Nitrohydrochloric acid, aqua regia, 58
    diluted, 58
Nitromuriatic acid, aqua regia, 58
    diluted, 58
Nitrous oxide, 122
Nutmeg, 184
  oil of, 184
  spirit of, 184
Nux vomica, 131–133
    extract of, 133
    fluid extract of, 133
    preparations and doses of, 133
    tincture of, 133

OFFICIAL PREPARATIONS, 19
Oil of bitter almond, 141
  cade, 227
  erigeron, 213
  gaultheria, 84
  neroli, 187
  orange flowers, 187
  santal, 213
  sweet birch, 84
  thyme, 186
  turpentine, 188, 201, 215, 257
    rectified, 216
  vitriol, 57
  wintergreen, 84
Ointment, 266
  of ammoniated mercury, 63
  of mercurial nitrate, 63
  of potassium iodide, 66
  of red mercuric oxide, 62
  of yellow mercuric oxide, 62
Ointments, 20, 21
Oleata, 21
Oleate of zinc, 238
Oleates, 20, 21
Oleatum hydrargyri, 62
  veratrinæ, 166
  zinci, 238
Oleic acid, 266
Oleoresina, aspidii, 200
  cubebæ, 217
  lupulini, 106
  piperis, 183
  zingiberis, 185
Oleoresinæ, 23
Oleoresins, 20, 23
Oleum æthereum, 130
  amygdalæ amaræ, 141
  anisi, 187
  aurantii corticis, 187
    florum, 187
  betulæ volatile, 84
  cadinum, 227
  cajuputi, 185
  cari, 187
  caryophylli, 184
  chenopodii, 200
  cinnamomi, 184
  copaibæ, 216
  coriandri, 187
  erigerontis, 213
  fœniculi, 187
Oleum gaultheriæ, 84, 186
  gossypii seminis, 267
  hedeoma, 186
  juniperi, 213
  lavendulæ florum, 186
  limonis, 169
  lini, 264
  menthæ piperita, 186
    viridis, 186
  morrhuæ, 70, 71
  myristicæ, 184
  phosphoratum, 55
  picis liquidæ, 227
  ricini, 189
  rosmarini, 186
  sabinæ, 176
  santali, 213
  sassafras, 76
  sesami, 267
  sinapis volatile, 257
  terebinthinæ, 201, 214, 215
    rectificatum, 216
  thymi, 186, 254, 255
  tiglii, 198
Opii emplastrum, 94
  extractum, 93
  pulvis, 93
Opium, 90, 95, 179
  chemical ingredients, 91
  deodoratum, 93
  deodorized, 93
  extract of, 93
  pills, 93
  plaster, 94
  powdered, 93
  powder of ipecac and, 90, 179
  preparations and doses of, 93, 94
  tincture of ipecac and, 90, 179
  treatment of poisoning by, 92
Orange, bitter, 187
  compound spirit of, 187
  fluid extract of bitter, 187
  oil of, 187
  spirit of, 187
  syrup of, 187
Orange flower, stronger water of, 187
    syrup of, 187
    triple water of, 187
Orange peel, sweet, 187
    tincture of bitter and sweet, 188
Ovis aries, 266

PALE ROSE, 232
    ointment of, 232
    stronger water of, 232
Pancreatin, 35, 36, 37
Pancreatinum, 35, 36
Papain, 35, 36, 37
Papers, 19, 20
Paraldehydum, 100
Pareira, 211
  fluid extract of, 212
Parillin, 74
Parvules, 23
Peculiar bitters, 42–47

Pelletierine tannate, 200
Pennyroyal, 186
Pepo, 20
Pepper, 183
  oleoresin of, 183
Peppermint, 186
  troches of, 186
Pepsin, 35, 36
Pepsinum, 35, 36
  saccharatum, 36
Peruvian balsam, 222
Petrolatum, liquid, 267
Petrolatum liquidum, 267
  molle, 267
  spissum, 267
Pharmocology, 17
Pharmacopœia, 19
Pharmacy, 17
Phenacetin, 81
  doses of, 81
Phenic acid, 250
Phenocoll, 81, 82
Phenol, 250
  cymylic, 254, 255
Phosphates, 71, 72
  preparations and doses of, 72
Phosphide, 72
Phosphite, 71
Phosphorated oil, 55
Phosphoric acid, 56, 58
    diluted, 58
Phosphorus, 53, 55
  pills of, 55
  preparations and doses of, 55
  tincture of, 55
  toxic effects of, 54
  treatment of poisoning by, 54
  uses of, 54
Physostigma, 135, 136
  extract of, 136
  preparations and doses of, 136
  tincture of, 136
Physostigminæ salicylas, 136
  sulphas, 136
Physostigmine salicylate, 136
  sulphate, 136
Picroconitine, 162
Picrotoxin, 134
Picrotoxinum, 134
Pills, 19, 20
Pilocarpidine, 220
Pilocarpinæ hydrochloras, 221
Pilocarpine, 222
  hydrochlorate, 221
Pilocarpos, 220, 221
  fluid extract of, 221
  preparations and doses of, 221
Pilulæ, 20
  aloes, 192
    et asafœtidæ, 128, 192
      ferri, 192
      mistaches, 192
      myrrhæ, 192
  antimonii compositæ, 162
  asafœtidæ, 128
Pilulæ catharticæ compositæ, 198
    vegitables, 198
  ferri carbonatis, 49
    iodidi, 50
  opii, 93
  phosphori, 55
  rhei, 191
    compositæ, 197
Pimenta, 184
  oil of, 184
Piperin, 183
Piperinum, 183
Pitch plaster with cantharides, 258
Pix burgundica, 257
  liquida, 227
Plaster of ammoniac with mercury, 62
  of Paris, 268
Plasters, 20, 21
Pleurisy, 224
Plumbi acetas, 235
  carbonas, 235, 236
  iodidum, 235
  nitras, 235
  oxidum, 235
Plumbum, 233, 236
Plummer's pills, 162
Podophyllotoxin, 196
Podophyllum, 196
Pomegranate, 200
Potassa, 204, 260
  cum calce, 260
  solution of, 204, 242
  sulphurata, 190, 191
  with lime, 260
Potassii acetas, 204
  bicarbonas, 204
  bichromas, 262
  bitartras, 195, 205
  bromidum, 99
  chloras, 205
  citras, 204
    effervescens, 204
  cyanidum, 141
  et sodii tartras, 195
  hypophosphis, 72
  iodidum, 66
  nitras, 205
  permanganas, 53, 245
  sulphas, 195
Potassio-tartrate of iron, 51
Potassium acetate, 204
  and sodium tartrate, 195
  bicarbonate, 204
  bichromate, 262
  bitartrate, 195, 205
  bromide, 99
  carbonate, 204
  chlorate, 205
  citrate, 204, 219
    effervescent, 204
    solution of, 204
  cyanide, 141
  hypophosphite, 72
  iodide, 66
  myronate 258

Potassium nitrate, 205
  nitrite, 138
  permanganate, 52, 53, 245
  sulphate, 194
Potato fly, 259
Poultices, 23
Powder of ipecac and opium, 94
Powders, 19, 20
Precipitated calcium carbonate, 243
    phosphate, 72
  sulphur, 190
Preparations, official, 19
Prepared chalk, 243
Prescription-writing, 26, 29
Prunus virginiana, 39, 41, 228
    fluid extract of, 41
    infusion of, 41
    syrup of, 41
Prussic acid, 139, 141
    treatment of poisoning by, 140
Pseudoconhydrine, 143
Pulsatilla, 167
Pulveris, 20
Pulvis antimonialis, 161
  aromaticus, 185
  cretæ compositus, 243
  effervescens compositus, 195
  glycyrrhizæ compositus, 193
  ipecacuanhæ et opii, 94
  jalapæ compositus, 196
  morphinæ compositus, 94
  rhei compositus, 191
Pumpkin seed, 201
Pure bitters, 37
Purified antimonious sulphide, 161
Pyrocatechin, 88, 89

QUASSIA, 37, 39
Quassiæ, 38
Quebracho, 222
Quercus alba, 232
Quevenne's iron, 49
Quicksilver, 60
Quillaja, 222, 224
  tincture of, 224
Quinicine, 43
Quinidinæ sulphas, 45
Quinidine, 42
  sulphate, 45
Quininæ, 174
  bisulphas, 45
  hydrobromas, 45
  hydrochloras, 45
  sulphas, 45
  valerianas, 45
Quinine, 42, 45, 82, 174
  bisulphate, 45
  hydrobromate, 45
  hydrochlorate 45
  sulphate, 45
  valerianate, 45

RED BARK, 42
  mercuric oxide, 62
  pepper, 183
Red precipitate ointment, 62
  rose, 232
    confection, 232
    fluid extract of, 232
    honey, 232
    syrup, 232
  saunders, 269
  wine, 148, 149
Remedies, 18, 19
  dietetic, 18
  hygienic, 18, 19
  mechanical, 18
  pharmaceutical, 18, 19
  physical, 18
Resin, 214, 215
Resina, 214, 215
  jalapæ, 196
  scammonii, 197
Resorcin, 88, 89
Resorcinum, 88, 89
Rhamnus purshiana, 189
Rheum, 191
Rhigolene, 124
Rhubarb, 191
  aromatic tincture of, 191
    syrup of, 191
  compound pills of, 191
  extract of, 191
  fluid extract of, 191
  mixture of soda and, 191
  pills, 191
  sweet, tincture of, 191
  syrup of, 191
  tincture of, 191
Rhus glabra, 232, 233
  toxicodendron, 133
Rochelle salt, 195
Rosa centifolia, 232
  gallica, 232
Rosemary, oil of, 186
Rose water, 232
Rufus pill, 192

SABINA, 176
Saccharated ferrous iodide, 50
  pepsin, 36
Saffron, 269
Sage, 39
Saigon cinnamon, 183
Sal ammoniac, 223
Salicin, 82-86
  preparations and doses of, 83, 84
Salicylas, 84
  lithii, 84
  methyl, 84
  sodii, 84
Salicylate, 84
  lithium, 84
  methyl, 84
  phenyl, 84
  physostigmine, 84
  sodium, 84
Salicylates, 82-86
  preparations and doses of, 83, 84
Salicylic acid, 82, 84, 219

Salicylic acid, preparations and doses of, 83, 84
Salicylicum, 83
  acidum, 83, 84
Salol, 85
  doses of, 85
Salophen, 85, 86
Saltpetre, 205
Salts of gold, 64
  lead, 39
  silver, 39
Salvia, 186
Sanguinaria, 222, 225
  fluid extract of, 225
  tincture of, 225
Sanguinarine, 225
Santalum rubrum, 269
Santonica, 200
Santonin, 200
  troches of, 200
Santoninum, 200
Saponin, 224
Sarsaparilla, 74, 75
  compound fluid extract of, 75
  fluid extract of, 75
  preparations and doses of, 75
Sassafras, 76
  medulla, 264
  oil of, 76
  pith, 264
Savine, 176
  fluid extract of, 176
  oil of, 176
Scammonium, 197
Scammony, 197
Scilla, 207, 208
Scoparius, 210
Scutellaria, 130
  fluid extract of, 130
Seidlitz powder, 195
Semi-solids, 19, 20
Senega, 222, 223
  fluid extract of, 224
  syrup of, 224
Senna, 193
  compound infusion of, 193
    powder of glycyrrhiza and, 193
  confection of, 193
  fluid extract of, 193
  syrup of, 193
Serpentaria, 39, 41, 222, 228
  fluid extract of, 41
  tincture of, 41
Sesamum, oil of, 267
Sevum, 266
Silver, 239, 240
  cyanide, 141, 240
  iodide, 240
  nitrate, 240, 262
    diluted, 240
    moulded, 240
  oxide, 240
Simple bitters, 37-39
    preparations and doses of, 38, 39
  syrup, 22
Sinalbin, 256
Sinapis, 180, 181
  alba, 256, 257
  nigra, 256, 257
Sinigrin, 256
Sinilacin, 74
Soap liniment, 129
  plaster, 235
Socotrine aloes, 192
Soda, 261
  caustic, 242, 261
  solution of, 242
Sodii acetas, 207, 208
  arsenas, 69
  bicarbonas, 242
  benzoas, 252
  bisulphis, 249
  boras, 249, 250
  bromidum, 99
  carbonas, 242
  exsiccatus, 242
  hypophosphis, 72
  hyposulphis, 249
  iodidum, 66
  nitris, 138
  phosphas, 195
  pyrophosphas, 195
  sulphas, 194, 195
  sulphis, 249
  sulphocarbolas, 251
Sodio-theobromine salicylate, 208, 209
Sodium acetate, 207
  arsenate, 69
  benzoate, 252
  bicarbonate, 242
    troches of, 242
  bisulphate, 249
  carbonate, 242
  hypophosphite, 72, 249
  nitrite, 138
  paraphenol sulphonate, 251
  phosphate, 196
  preparations of, 242
  pyrophosphas, 195
  silicate, solution of, 269
  sulphate, 194, 195
  sulphocarbolate, 251
Soft petrolatum, 267
Solidified copabia, 216
Solids, 19
Soluble ferric phosphate, 50
  iron and quinine citrate, 51
    pyrophosphate, 50
Solution of ammonium acetate, 219
  of arsenic and mercuric iodide, 69
  of arsenous acid, 69
  of boroglycerite, 250
  of ferric acetate, 50
      chloride, 50
      citrate, 50
      nitrate, 50
      subsulphate, 50
      sulphate, 50
  of iron and [illegible] te, 50
  of mercuric

Solution of potassium arsenite, 69
  of sodium arsenate, 69
    silicate, 269
  of zinc chloride, 239
Solutions, 20, 21
Spanish fly, 258
Sparteinæ sulphas, 157, 210
Sparteine sulphate, 157
Spearmint, 186
Spermaceti, 266
Sphacelinic acid, 171
Spigelia, 199
  fluid extract of, 200
Spirit of glonoin, 138
  of mindererus, 219
  of nitroglycerin, 138
  of nitrous ether, 210, 211, 219
  of phosphorus, 55
Spirits, 20, 22
Spiritus, 22
  ætheris, 119, 130
    compositus, 130
    nitrosi, 210, 211, 219
  ammoniæ, 151
    aromaticus, 151
  amygdalæ amaræ, 141, 142
  anisi, 187
  aurantii, 187
    compositus, 187
  camphoræ, 129
  chloroformi, 121
  cinnamomi, 184
  frumenti, 148
  gaultheriæ, 186
  glonoini, 138
  juniperi, 213
    compositus, 213
  lavendulæ, 186
  limonis, 169
  myristicæ, 184
  phosphori, 55
  vini gallici, 148
Squill, 207, 222, 228
  compound syrup of, 208
  fluid extract of, 208
  syrup of, 208
  tincture of, 208
Star anise, 187
Starch, 265
Stillingia, 76, 77
  fluid extract of, 77
Stramonium, 111
  fluid extract of, 111
  ointment of, 111
  preparations of, 111
  seed, extract of, 111
  tincture of, 111
Strontii bromidum, 99
  iodidum, 67
  lactas, 207
Strontium iodide, 67
  lactate, 207
Strophanthin, 157
Strophanthus, 157
  tincture of, 157
Strychninæ, 133
  sulphas, 133
Strychnine, 131-133, 166
  preparations and doses of, 133
  sulphate, 133
  treatment of poisoning by, 132
Sublimated sulphur, 190
Suet, 266
Sugar of lead, 235
Sulphides, 248, 249
Sulphites, 248, 249
Sulphonal, 100, 102
Sulphur, flowers of, 190
  iodide, 166
  lotum, 190
  ointment, 190
  sublimatum, 190
  washed, 190
Sulphurated antimony, 162
  lime, 249
  potassa, 190, 191, 249
Sulphuric acid, 56, 57
    diluted, 58
Sulphuris iodidum, 66
Sulphurous acid, 248
Sumach, 232, 233
  fluid extract, 233
Suppositoria, 21
  glycerini, 267
Suppositories, 20, 21
Sweet spirit of nitre, 219
Swertia chirata, 37
Sydenham's laudanum, 94
Syrupi, 22
Syrup of calcium lactophosphate, 72
  of ferrous iodide, 50
  of hypophosphites, 72
      with iron, 72
  of iron, quinine, and strychnine phosphate, 51
  simple, 22
Syrups, 20, 22
Syrupus acaciæ, 263
  acidi citrici, 169
  allii, 225
  althææ, 264
  amygdalæ, 142
  aurantii, 187
    florum, 187
  calcii lactophosphatis, 72
  calcis, 243
  ferri iodidi, 50
    quininæ, et strychninæ phosphatum, 50
  hypophosphitum, 72
    cum ferro, 72
  ipecacuanhæ, 179
  krameriæ, 231
  lactucarii, 106
  picis liquidæ, 227
  prunus virginianæ, 41
  rhei, 191
    aromaticus, 191
  rosæ, 232
  sarsaparillæ compositus, 161, 208

Syrupus senegæ, 224
  sennæ, 193
  tolutanus, 227
  zingiberis, 185
Systemic medicines, 35, 244

TABACUM, 144, 145
Tamarind, 189
Tamarindus, 189
Tanacetin, 176
Tanacetum, 176
Tannic acid, 229
    glycerite of, 230
    ointment of, 230
    troches of, 230
Tansy, 176
Tar, 222, 227
  oil of, 227
  ointment of, 227
  water, 227
Taraxacum, 210
  extract of, 210
  fluid extract of, 210
Tartarated antimony, 161
Tartar emetic, 161, 181, 222
Tartaric acid, 169
Terebene, 222, 228
Terebenum, 228
Terebinthina, 214, 216
  Canadensis, 214
Terpin, 222
  hydrate, 228
Terpini hydras, 227
Test for cinchona alkaloids, 43
Tetronal, 103, 104
Tetterwort, 197
Thalline, 87
Theine, 155
Therapeutics, 17, 18
  empirical, 18
  rational, 18
Thoroughwort, 39
Thymol, 186, 254, 255
Tinctura aconiti, 163
  aloes, 192
    et myrrhæ, 192
  arnicæ radicis, 167
  asafœtida, 128
  belladonnæ, 110
  benzoini, 226
    composita, 226
  byroniæ, 196
  calendulæ, 76
  cannabis indicæ, 105
  cantharidis, 217, 259
  cardamomi, 185
    composita, 185
  catechu composita, 231
  cimicifugæ, 159
  cinchonæ, 45
    composita, 45
  cinnamomi, 184
  colchici, 74
  croci, 269
  cubebæ, 217
Tinctura capsici, 183
  digitalis, 154
  ferri chloridi, 50
  gallæ, 231
  gelsemii, 139
  guaiaci, 75
  humuli, 106
  hyoscyami, 112
  iodi, 66
  ipecacuanhæ, 94
  kino, 231
  krameriæ, 231
  lactucarii, 106
  lavendulæ composita, 186
  lobeliæ, 142
  matico, 217
  moschi, 127
  nucis vomicæ, 133
  opii, 94
    camphorata, 94
    deodorata, 94
  physostigmatis, 136
  quillajæ, 224
  rhei, 191
    aromaticus, 192
    dulcis, 192
  sanguinariæ, 225
  scillæ, 208
  serpentariæ, 41
  stramonii seminis, 111
  strophanthi, 157
  tolutani, 226
  valerinæ, 127
    ammoniata, 127
  vanillæ, 188
  veratri viridis, 165
  zingiberis, 185
Tincturæ, 22
Tincture of aconite, 126
  of camphorated opium, 94
  of colchicum, 74
  of deodorized opium, 94
  of elaterine, 198
  of ferric chloride, 50
  of guaiac, 75
  of iodine, 66
  of ipecac and opium, 94
  of opium, 94
Tinctures, 20, 22
Tobacco, 144, 145
  camphor, 144
Tolu, balsam of, 227
  syrup of, 227
  tincture of, 227
Tonics, mineral, 47, 59
  vegetable, 37–47
    subdivision of, 37
Toxicology, 17
Tragacanth, 264
Tragacantha, 264
Trional, 102
Triticum, 212
  fluid extract of, 212
Trituratio elaterine, 198
Triturationes, 20

- Triturations, 19, 20
- Troches, 20
- Trochisci, 20
  - acidi tannici, 230
  - ammonii chloridi, 233
  - catechu, 231
  - cretæ, 243
  - cubebæ, 217
  - ferri, 49
  - glycyrrhizæ et opii, 94
  - ipecacuanhæ, 179
  - krameriæ, 231
  - menthæ piperitæ, 186
  - morphinæ et ipecacuanhæ, 94
  - potassii chloratis, 206
  - santonini, 200
  - sodii bicarbonatis, 242
  - zingiberis, 185
- Tully's powder, 94
- Turpentine, 214, 216, 222, 228
  - Bordeaux, 214
  - Canada, 214
  - Chian, 214
  - Venice, 214
- Turpeth mineral, 63, 181
- Tutty, 238

- ULMUS, 264
- Unguenta, 21
- Unguents, 21
- Unguentum, 266
  - acidi carbolici, 251
    - tannici, 230
  - aquæ rosæ, 232
  - belladonnæ, 110
  - diachylon, 235
  - gallæ, 231
  - hydrargyri, 62
    - ammoniati, 63
    - nitratis, 63
    - oxidi flavi, 62
      - rubri, 62
  - iodi, 66
  - iodoformi, 248
  - picis liquidæ, 227
  - plumbi carbonatis, 236
    - iodidi, 235
  - potassii iodidi, 66
  - stramonii, 111
  - sulphurus, 190
  - veratrinæ, 166
  - zinci oxidi, 238
- Unslaked lime, 243
- Urethan, 104
- Uva ursi, 212

- VALERIAN, 127
  - ammoniated tincture of, 127
  - fluid extract of, 127
  - preparations and doses of, 127
  - tincture of, 127
- Valeriana, 127
- Vanilla, 188
- Vanillin, 188
- Vegetable cathartic pills, 198
- Vegetable tonics, 37–47
- Veratrine, 165, 166
  - ointment of, 166
  - oleate of, 166
  - uses and preparations of, 166
- Veratroidine, 164
- Veratrum viride, 164, 165, 218
  - fluid extract of, 165
  - preparations and doses of, 165
  - tincture of, 165
- Viburnum, fluid extract of, 175
  - prunifolium, 175
- Vienna paste, 260
- Vina, 22
- Vinegar of opium, 94
- Vinegars, 20, 22
- Vinum album, 148
  - antimonii, 161
  - colchici radicis, 74
  - ergotæ, 173
  - ferri amarum, 51
    - citratis, 51
  - ipecacuanhæ, 179
  - opii, 94
  - rubrum, 148, 149
  - seminis, 74
- Viola tricolor, 189
- Virginia snakeroot, 39
- Veratrina, 165, 166
  - uses and preparations of, 166
- Volatile oil of betula, 84

- WAHOO, 193
- Washed sulphur, 190
- Washes, 23
- Waters, 20, 21
- Wax, white, 266
  - yellow, 266
- Weight, apothecaries', 23
  - relation of, to metrical system, 25
- Weights and measures, 23-26.
  - decimal, 24
  - metrical, 24
- Whiskey, 148
- White arsenic, 69
  - lead, 232
  - oak, 232
  - precipitate 63
  - vitriol, 238
  - wine, 148
- Wild cherry, 39
- Wine measure, 24
  - relation of, to metrical system, 28
  - of antimony, 161
  - of colchicum root, 74
    - seed, 74
  - of iron citrate, 51
  - of opium, 94
- Wines, 20, 22
- Wintergreen, 186
- Wisters' cough drops, 94
- Witch hazel, 232
- Woorali, 144
- Woorara, 144
- Wormwood, 40

YELLOW BARK, 42
  mercurial subsulphate, 61, 181
  mercuric oxide, 62
  root, 46
Young's rule for dose in children, 31

ZEA, 214
  fluid extract of, 214
Zinc acetate, 238
  bromide, 99, 239
  carbonate, precipitated, 238
  chloride, 238, 261
  iodide, 239
  ointment, 238
Zinc oxide, 238
  phosphide, 55, 239
  sulphate, 181, 238
  valerianate, 239
Zinci acetas, 238
  bromidum, 99, 239
  carbonas præcipitatus, 238
  chloridum, 238, 261
  iodidum, 239
  phosphidum, 55, 239
  sulphas, 181, 238
  valerianas, 239
Zincum, 238, 239
Zingiber, 184, 185

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	PAGE
American Pocket Medical Dictionary	31
*American Text-Book of Applied Therapeutics	6
*American Text-Book of Chemistry	40
*American Text-Book of Diagnosis	40
*American Text-Book of Dis. of Children	11
*An American Text-Book of Diseases of the Eye, Ear, Nose, and Throat	13
*An American Text-Book of Genito-Urinary and Skin Diseases	12
*American Text-Book of Gynecology	10
*American Text-Book of Legal Medicine	40
American Text-Book of Nursing	40
*American Text-Book of Obstetrics	7
*American Text-Book of Pathology	40
*American Text-Book of Physiology	5
*American Text-Book of Practice	8
*American Text-Book of Surgery	9
Anders' Theory and Practice of Medicine	17
Ashton's Obstetrics	39
Atlas of Skin Diseases	24
Ball's Bacteriology	39
Bastin's Laboratory Exercises in Botany	32
Beck's Surgical Asepsis	37
Boisliniere's Obstetric Accidents	35
Brockway's Physics	39
Burr's Nervous Diseases	37
Butler's Materia Medica and Therapeutics	20
Cerna's Notes on the Newer Remedies	28
Chapin's Compendium of Insanity	31
Chapman's Medical Jurisprudence	37
Church and Peterson's Nervous and Mental Diseases	15
Clarkson's Histology	29
Cohen and Eshner's Diagnosis	39
Corwin's Diagnosis of the Thorax	33
Cragin's Gynæcology	39
Crookshank's Text-Book of Bacteriology	23
DaCosta's Manual of Surgery	19
De Schweinitz's Diseases of the Eye	25
Dorland's Pocket Medical Dictionary	31
Dorland's Obstetrics	37
Frothingham's Bacteriological Guide	26
Garrigues' Diseases of Women	30
Gleason's Diseases of the Ear	39
*Gould and Pyle's Anomalies and Curiosities of Medicine	15
Griffith's Care of the Baby	34
Griffith's Infant's Weight Chart	35
Gross's Autobiography	22
Hampton's Nursing	35
Hare's Physiology	39
Hart's Diet in Sickness and in Health	32
Haynes' Manual of Anatomy	37
Heisler's Embryology	40
Hirst's Obstetrics	16
Holmes' Manual of Surgery	40
Hyde's Syphilis and Venereal Diseases	37
International Text-Book of Surgery	40
Jackson's Diseases of the Eye	40
Jackson and Gleason's Diseases of the Eye, Nose, and Throat	39
Keating's Pronouncing Dictionary	22
Keating's Life Insurance	35
Keen's Operation Blanks	32
Keen's Surgery of Typhoid Fever	18

	PAGE
Kyle's Diseases of Nose and Throat	40
Lainé's Temperature Charts	28
Lockwood's Practice of Medicine	37
Long's Syllabus of Gynecology	30
Macdonald's Surgical Diagnosis and Treatment	18
McFarland's Pathogenic Bacteria	26
Mallory and Wright's Pathological Technique	18
Martin's Surgery	39
Martin's Minor Surgery, Bandaging, and Venereal Diseases	39
Meigs' Feeding in Early Infancy	26
Moore's Orthopedic Surgery	19
Morris' Materia Medica and Therapeutics	39
Morris' Practice of Medicine	39
Morten's Nurses' Dictionary	34
Nancrede's Anatomy and Dissection	27
Nancrede's Anatomy	39
Nancrede's Principles of Surgery	40
Norris' Syllabus of Obstetrical Lectures	33
Ogden's Urinary Analysis	40
Penrose's Diseases of Women	20
Powell's Diseases of Children	39
Pryor's Pelvic Inflammations	40
Pye's Bandaging and Surgical Dressing	19
Raymond's Physiology	37
Rowland's Clinical Skiagraphy	29
Saundby's Renal and Urinary Diseases	21
*Saunders' American Year-Book of Medicine and Surgery	14
Saunders' Medical Hand-Atlases	3, 4
Saunders' Pocket Medical Formulary	31
Saunders' New Series of Manuals	36, 37
Saunders' Series of Question Compends	38, 39
Sayre's Practice of Pharmacy	39
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Senn's Genito-Urinary Tuberculosis	20
Senn's Tumors	21
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Stoney's Practical Points in Nursing	23
Sutton and Giles' Diseases of Women	25, 37
Thomas's Diet-List and Sick-Room Dietary	34
Thornton's Dose-Book and Manual of Prescription-Writing	37
Thresh's Water and Water Supplies	29
Van Valzah and Nisbet's Diseases of the Stomach	17
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